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THE PELAGIC COPEPODS OF THE IZU REGION, MIDDLE JAPAN
SYSTEMATIC ACCOUNT IX¹⁾

FAMILIES CENTROPAGIDAE, PSEUDODIAPTOMIDAE,
TEMORIDAE, METRIDIIDAE AND LUCICUTIIDAE

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With 23 Text-figures

Family CENTROPAGIDAE

Genus *Centropages* HERRICK

A. SCOTT (1909) recorded the occurrence of the following species from the Malay Archipelago: *Centropages calaninus* (DANA), *C. elongatus* GIESBRECHT, *C. furcatus* (DANA), *C. gracilis* (DANA), *C. orsini* GIESBRECHT. In 1932 SEWELL in his "Copepoda of Indian seas" recorded the following 11 species, namely, *C. alcoccki* SEWELL, *C. calaninus* (DANA), *C. dorsispinatus* THOMPSON and A. SCOTT, *C. elongatus* GIESBRECHT, *C. furcatus* (DANA), *C. gracilis* (DANA), *C. kroeyeri* GIESBRECHT, *C. orsini* GIESBRECHT, *C. tenuiremis* THOMPSON and A. SCOTT, *C. trispinosus* SEWELL, and *C. violaceus* (CLAUS). MORI (1937) recorded the following species from the Japanese waters: *C. abdominalis* SATO, *C. yamadai* MORI, *C. orsini* GIESBRECHT, *C. bradyi* WHEELER, *C. elongatus* GIESBRECHT, *C. calaninus* (DANA), *C. longicornis* MORI, *C. gracilis* (DANA), *C. violaceus* (DANA) and *C. furcatus* (DANA). The species of the genus are surface-living form, and most of them are widely distributed in the warm waters of the oceans. In my collection I have been able to detect the following 8 species from the Izu region, namely, *C. calaninus* (DANA), *C. gracilis* (DANA), *C. furcatus* GIESBRECHT, *C. orsini* GIESBRECHT, *C. longicornis* MORI, *C. bradyi* WHEELER, *C. abdominalis* SATO and *C. yamadai* MORI. Among these *C. abdominalis* and *C. bradyi* prefer cold water and are frequent in the northern water around Hokkaido. In my previous paper (1960) dealt with the pelagic copepods taken by the Japanese Antarctic Expedition I have described *C. typicus* Kroeyer by the specimen taken in the neighbouring water of Cape Town but it is erroneous, the species is distinctly *C. chierchiae* GIESBRECHT.

1) Part VIII appeared in this Journal, Vol. X, No. 1, pp. 35-90 (1962).

Centropages calaninus (DANA).

Centropages calaninus, GIESBRECHT, 1892, p. 305, t. 17, figs. 27, 28, 43; t. 18, figs. 1, 21; A. SCOTT, 1909, p. 112; SEWELL, 1913, p. 367; 1932, p. 228; FARRAN, 1936, p. 108; MORI, 1937, p. 61, pl. 30, figs. 4-7; SEWELL, 1947, p. 163.

Female. Length, 1.81-1.95 mm. The bodomen is contained 2.5 times in the length of the cephalothorax. The lateral corner of the last thoracic segment rounded. The furca asymmetrical; the right side is longer and thicker than the left. The 1st antenna exceeds the end of the furca by terminal 3 segments. The 1st leg has a small notch on the outer margin of the 2nd segment of the exopod. The 5th pair of legs has an inner marginal spine on the 2nd segment of the exopod, which is about as long as the combined length of the 2nd and 3rd segments of the exopod.

Male. Length, 1.68-1.86 mm. The cephalothorax and abdomen are asymmetrical. The right 1st antenna has the segments 19-21 which are shorter than those of *C. gracilis*. The left 5th leg has 2 finely serrated plates on the apex of the terminal segment of the exopod.

Occurrence. The species is common in summer and autumn seasons when the water temperature is high.

Distribution. The species has been chiefly recorded from the Indo-Pacific. In Japan the species is widely distributed in warm water.

Centropages gracilis (DANA)

Centropages gracilis, GIESBRECHT, 1892, p. 305, t. 17, 38; A. SCOTT, 1909, p. 114; MORI, 1937, p. 61, pl. 30, figs. 4-7; SEWELL, 1947, p. 163.

Female. Length, 1.93-2.07 mm. The lateral corner of the last thoracic segment rounded. The thoracic segments are covered with stiff hairs. The genital segment has spinules on the lateral corner of the right side; the 2nd segment has spinules on each of the lateral margins; the ventral surface carries a rounded process. The furcal rami about 3 times as long as wide. The 1st antenna exceeds the end of the furca by last 5 segments. The 5th pair of legs slightly asymmetrical; the spine on the 2nd segment of the exopod of the left leg is slightly longer than that of the right.

Male. Length, 1.79-1.95 mm. The 4th abdominal segment is very short. The furcal rami about 4 times as long as wide. The left 1st antenna exceeds the end of the furca by last 3 segments. The middle section of the right 1st antenna slender. The terminal claw of the right 5th leg has a triangular process on the proximal inner margin.

Occurrence. The species is fairly common in autumn.

Distribution. It has been recorded from the Pacific and Indian Oceans. In Japan it is distributed in temperate water.

Centropages furcatus (DANA).

Centropages furcatus, GIESBRECHT, 1892, p. 304, t. 28, figs. 1-11; A. SCOTT, 1909, p. 113: WOLFENDEN, 1911, p. 356; SEWELL, 1912, pp. 315, 360; GURNEY, 1927, p. 150; FARRAN, 1929, p. 255; SEWELL, 1932, p. 229; FARRAN, 1937, p. 108; MORI, 1937, p. 63, pl. 32, figs. 1-2.

Female. Length, 1.82 mm. The frontal margin of the head truncate. The head has a large ventral eye. The last thoracic segment symmetrical, with a long process and a shorter one on the lateral corner. The abdominal segments and furca are in the proportional lengths as 25 : 12 : 30 : 33 = 100. The 1st antenna 24-jointed, extends to the end of the anal segment; the 1st, 2nd and 5th segments have each a strong spine on the anterior margin. The inner marginal spine on the 2nd segment of the exopod of the 5th leg straight and stout.

Male. Length, 1.66-1.72 mm. The last thoracic segment slightly asymmetrical. The anal segment well developed, about as long as the 3rd abdominal segment. The furcal rami 3 times as long as the anal. The outer edge spine on the 2nd segment of the exopod of the 4th leg long. The thumb on the 2nd segment of the exopod of the right 5th leg about as long as the terminal claw. The terminal segment of the left 5th leg broad and long with 2 setae near the apex.

Occurrence. The species is rather rare in the Izu region. 2 females and 15 males were taken from the surface in the early winter of 1934.

Distribution. The species has a wide distribution and has been recorded from the Pacific, Atlantic and Indian Oceans. Around Japan it is distributed in warm water.

Centropages orsini GIESBRECHT

Centropages orsini, GIESBRECHT, 1892, p. 305 t. 17, figs 35, 36; t. 18, figs. 2, 14, 23, t. 38, figs. 12, 19; A. SCOTT, 1909, p. 115; SEWELL, 1912, p. 315, 362; 1914, p. 221; 1932, p. 230; FARRAN, 1936, p. 109; MORI, 1937, p. 60, pl. 29, figs. 1-7; SEWELL, 1947, p. 163.

Male. Length, 1.48 mm. The last thoracic segment slightly asymmetrical; the left side is slightly longer than the right. The lateral corner of the last thoracic segment triangular and pointed at the apex. The furcal rami about 2 times as long as wide. The left 1st antenna 24-jointed, extends to the middle of the furca; the right antenna has a weak process on the anterior margin of the 15th and 16th segments. The terminal claw of the right 5th leg slender. The last segment of the left leg is produced into a long spine.

Occurrence. One male specimen in the winter, 1933 from the surface.

Distribution. The species has been reported from the East China Sea, Red Sea, Maly Archipelago and the Arabian Sea.

Centropages longicornis MORI

(Fig. 152, a-c)

Centropages longicornis, MORI, 1937, p. 170, pl. 30, figs. 8-11.

Female. Length, 1.88 mm. The last thoracic segment symmetrical. The lateral corner of the last thoracic segment rounded. The abdomen, 3-segmented; the genital segment rounded in lateral aspect, with a ventral protuberance overlapping the following segment. The furcal rami 3 times as long as wide. The 1st antenna exceeds the end of the furca by terminal 5 segments. The inner marginal spine on the 2nd segment of the exopod of the 5th leg is about as long as the 3rd segment of the exopod. The inner marginal spine on the 1st segment of the exopod is notched on the inner margin.

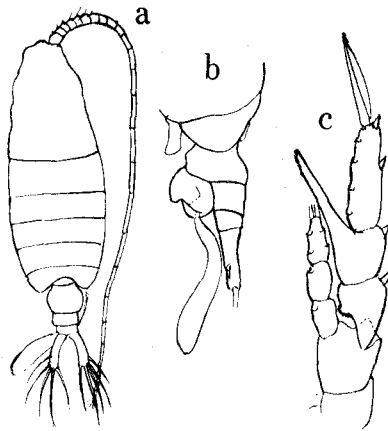


Fig. 152. *Centropages longicornis* MORI.
Female: a, dorsal aspect; b, last thoracic segment and abdomen, lateral aspect; c, 5th leg.

Occurrence. One female in the summer of 1933.

Distribution. The species has been reported by MORI from the East China Sea.

Centropages bradyi WHEELER

Centropages bradyi, ESTERLY,; 905, p. 172; SATO, 1913, p. 25; WILSON, 1932, p. 86; MORI, 1937, p. 60, pl. 29, figs. 8-13; BRODSKY, 1950, p. 221.

Female. Length, 1.6 mm. The head is constricted at the lateral margin on the oral part. The last thoracic segment rounded in lateral aspect. The genital segment rounded; the 2nd segment has a rounded ventral process. The furcal rami slightly less than 3 times as long as wide. The 1st antenna exceeds

the end of the furca by last 6 segments. The inner marginal spine of the 2nd segment of the exopod of the 5th pair of legs short.

Occurrence. 6 females in November, 1932 from the surface.

Distribution. The species has been recorded from the Pacific and Atlantic Oceans. In Japan it occurs frequently in cold water.

Centropages abdominalis SATO

Centropages abdominalis, SATO, 1913, p. 26, pl. 4, figs. 63, 65; pl. 5, figs. 64, 66-68; MORI, 1937, p. 58, pl. 28, figs. 1-6.

Female. Length, 1.61 mm. The species allies very closely to *C. hamatus* LILLJEBORG. The last thoracic segment asymmetrical with the lateral corner produced into an acute spine. The genital segment asymmetrical, with a lateral swelling on the right side; the left side is furnished with rows of spinules; the ventral surface has a spine behind the genital opening. The 1st antenna 24-jointed, extends beyond the end of the furca by terminal 3 segments. The inner marginal spine on the 2nd segment of the exopod of the 5th pair of legs is longer than the segment itself.

Male. Length, 1.43-1.52 mm. The body is slender. The last thoracic segment symmetrical with a small process on the lateral corner. The abdomen 4-segmented; the anal segment fused with the furca. The middle section of the right 1st antenna is not tumified. The chela of the right 5th leg more slender than that of *C. hamatus*.

Occurrence. The species is common in spring season.

Distribution. The species has been first described from Hokkaido but the species appears to be widely distributed in the neighbouring waters of Japan.

Centropages yamadai MORI

(Fig. 153, a-c)

Centropages yamdai, MORI, 1937, p. 59, pl. 28, figs. 7-12.

Female. Length, 1.50 mm. The species has a general resemblance to *C. typicus* KROEYER. The last thoracic segment slightly asymmetrical. The lateral corner produced into a wing-like process extending to the end of the genital segment. The abdominal segments and furca are in the proportional lengths as 26 : 23 : 16 : 35 = 100. The genital segment slightly asymmetrical; the left margin irregularly swollen. The furcal rami 3.6 times as long as wide; the outermost seta spiniform. The 1st antenna 24-segmented, exceeds the end of the abdomen by last 2 segments. The 5th pair of legs asymmetrical; the inner marginal spine on the 2nd segment of the exopod of the right leg is serrated; the 2nd segment of the endopod is covered with minute spinules.

Male. Length, 1.32-1.41 mm. The last thoracic segment and abdomen symmetrical. The combined length of the abdominal segment and furca is contained 2 times in the length of the cephalothorax. The furcal rami 3 times as long as wide. The 17th segment of the right 1st antenna has a comb-like process. The thumb on the 2nd segment of the exopod of the right 5th leg is shorter than the terminal claw.

Occurrence. The species is common in early summer.

Distribution. It has been reported by MORI from the warm water of Japan.

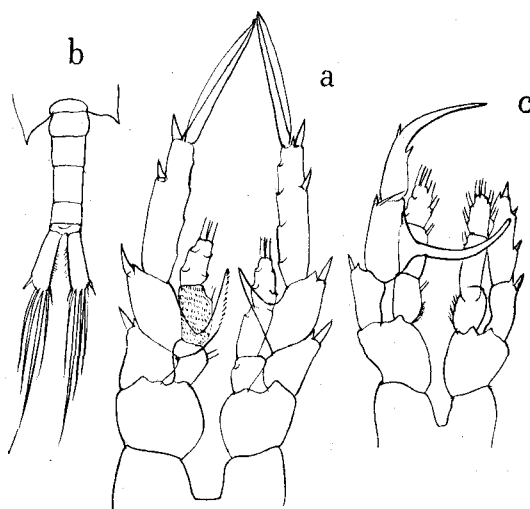


Fig. 153. *Centropages yamadai* MORI.

Female: a, 5th pair of legs. Male: b, last thoracic segment and abdomen, dorsal aspect; c, 5th pair of legs.

Genus *Isias* BOECK.

The genus has been represented by a single species, *Isias clavipes* BOECK until SEWELL recorded the occurrence of *I. tropica* SEWELL from the Chilka Lake. No specimens of the genus have been recorded from the Japanese waters.

Family PSEUDODIAPTOMIDAE

Genus *Pseudodiaptomus* HERRICK

SEWELL has recorded a large number of species of this genus from the seas and brackish water areas of India. A. SCOTT recorded in his account of copepoda of the "Siboga" *Pseudodiaptomus surivilli* CLEVE, *P. clevei* A. SCOTT. In Japan SATO (1912) recorded *P. marinus* SATO from the northern

water surrounding Hokkaido. Up to the present time I have failed to detect any of the species from the Izu region, though the last species is very common in Japanese waters.

Family TEMORIDAE

Genus *Temora* BAIRD.

The following species have been recorded from the Malayan and Indian seas, namely, *Temora discaudata* GIESBRECHT, *T. turbinata* (DANA) and *T. styliфера* (DANA). MORI recorded the occurrence of these three species from the neighbouring waters of Japan. I have found all of them from the surface layer of the Izu region.

Temora turbinata (DANA)

Temora turbinata, GIESBRECHT, 1892, p. 329, t. 17, figs. 14, 17, 18, 21; t. 38, fig. 21; MARUKAWA, 1908, p. 11; A. SCOTT, 1909, p. 119; SEWELL, 1912, p. 366; Sato, 1913, p. 29; SEWELL, 1914, p. 227; Sars, 1925, p. 193; MORI, 1929, p. 175; FARRAN, 1929, p. 258; WILSON, 1932, p. 246; MORI, 1937, p. 64, pl. 32, figs. 3-8.

Female. Length, 1.41-1.57 mm. The cephalic segment broad. The thoracic segment gradually contracts posteriorly; the last thoracic segment fused with the 4th; the lateral corner narrowly rounded. The combined length of the abdominal segments and furca is contained about 2 times in the length of the cephalothorax; the 2nd abdominal segment is longer than the anal. The furcal rami 9 times as long as it is wide at the proximal. The 1st antenna extends to the end of the genital segment. The 5th pair of legs 3-jointed; the 3rd segment has 3 apical spines and an outer marginal one.

Male. Length, 1.32-1.43 mm. The right 1st antenna forms a grasping organ. The 2nd basal segment of the left 5th leg has a long curved spine on the inner margin; the right leg is short.

Occurrence. The species is one of the most common one in summer time.

Distribution. It is widely distributed in the warm waters of the Pacific and Indian Oceans.

Temora discaudata GIESBRECHT

Temora discaudata, GIESBRECHT, 1892 p. 328 t. 17, figs. 3, 20, 23; t. 38, figs. 25, 25, 28; A. SCOTT, 1909, p. 118; SEWELL, 1912, p. 365; SATO, 1913, p. 31; SEWELL, 1914, p. 227; GURNEY, 1927, p. 151; MORI, 1927, p. 175; SEWELL, 1932, p. 245, MORI, 1937, p. 65.

Female. Length, 1.62-2.05 mm. The lateral corner of the last thoracic segment produced into a spine. The anal segment and furcal rami asymmetrical.

The 1st antenna extends to the end of the anal segment. The 5th pair of legs as in *T. turbinata* (DANA) but the terminal spine is longer.

Male. Length, 1.68–1.88 mm. The last thoracic segment asymmetrical. The furcal rami very long, about 11 times as long as wide. In the left 2nd leg the terminal spine of the exopod has a row of spinules on the inner distal margin; the spine on the distal outer margin of the 3rd segment of the exopod is long. The left 5th leg has a leaf-like process on the 2nd basal segment; the distal segment of the exopod of the right 5th leg is long and curved.

Occurrence. Very common in summer time.

Distribution. It is widely distributed in the Pacific and Indian Oceans, also in the Mediterranean Sea. In Japan it has been recorded from the warm water.

Temora stylifera (DANA)

Temora stylifera, GIESBRECHT, 1892, p. 328, t. 5, fig. 2; t. 17, figs. 2, 4, 12, 19, 22 t. 38, figs. 26, 29; SARS, 1925, p. 193; GURNEY, 1927, p. 151; WILSON, 1932, p. 104; SEWELL, 1932, p. 246; MORI, 1937, p. 66.

Female. Length, 1.34 mm. The cephalic segment has a wing-like expansion on the lateral distal corner. The abdomen 3-jointed, symmetrical. The furcal rami about as long as the combined length of the 3 abdominal segments. The 1st antenna extends to the middle of the furca. The 5th pair of legs as in *T. discaudata* but the apical spine is slender.

Male. Length, 1.40 mm. The specimen is in the 5th copepodite stage. General appearance as in the female. The abdomen 4-jointed. The furcal rami 5 times as long as wide. The right 1st antenna undeveloped. In the 2nd leg the distal outer spine on the 3rd segment of the exopod short; the terminal spine of the exopod has no denticle on the inner distal margin. The 5th pair of legs undeveloped.

Occurrence. The specimen has been collected in summer time but not so common as *T. discaudata*. The male specimens were all immature.

Distribution. The species has been recorded from the tropical areas of the Atlantic and Pacific Oceans, and also from the Mediterranean Sea and the Red Sea.

Genus *Temoropia* T. SCOTT

A. SCOTT recorded the occurrence of *Temoropia mayumbaensis* T. SCOTT from the Malay Archipelago. FARRAN recorded the species from the Great Barrier Sea. But SEWELL failed to find it from the Indian seas. Up to the present time no specimens of the genus have been found from the Izu region. The species appears to be of pure tropical in nature.

Genus *Eurytemora* GIESBRECHT.

From Japanese water SATO (1913) recorded the occurrence of *Eurytemora pacifica* SATO and *E. herdmanni* THOMPSON and A. SCOTT. MORI recorded the latter species from the northern water of Japan. No specimens have been obtained from the Izu region.

Family METRIDIIDAE

Genus *Metridia* BOECK

A. SCOTT recorded the occurrence of 5 species of this genus from the Malay Archipelago, namely, *Metridia boeckii* GIESBRECHT, *M. brevicauda* GIESBRECHT, *M. macrura* SARS, *M. princeps* GIESBRECHT and *M. venusta* GIESBRECHT. SEWELL recorded in addition to the species above listed *M. curticauda* GIESBRECHT from the Indian seas. In Japan only a single species *M. lucens* BOECK, has been recorded from cold water by SATO and MORI. I have been able to detect in my collection *M. curticauda*, *M. venusta*, *M. brevicauda*, *M. princeps*, *M. okhotensis* BRODSKY and *M. pacifica* BRODSKY. Among these *M. curticauda*, *M. venusta*, *M. brevicauda* and *M. princeps* are frequent in the tropical area of the Malay Archipelago and Indian seas. But *M. lucens* has not been recorded from the tropical area by A. SCOTT or by SEWELL but SERS recorded its occurrence from the Red Sea. *M. lucens*, *M. longa*, *M. okhotensis* and *M. pacifica* appear to be of arctic origin, and the occurrence of the last two species in the deep water of the Izu region suggests the inflow of the cold undercurrent from the northern area of Japan. *M. okhotensis* and *M. pacifica* have been recorded from the far-eastern and polar seas of the U.S.S.R. The former is closely allied to *M. longa* (LUBBOCK) and the latter to *M. lucens* BOECK.

Metridia curticauda GIESBRECHT

(Fig. 154, a-g)

Metridia curticauda, GIESBRECHT, 1892, p. 340, t. 33, figs. 4, 15, 33; WOLFENDEN, 1911, p. 286; FARRAN, 1929, p. 259; SEWELL, 1932, p. 248; BRODSKY, 1950, 1950, p. 203.

Female. Length, 3.57 mm : cephalothorax, 2.25 mm ; abdomen, 1.32 mm ; so the abdomen is contained 1.7 times in the length of the cephalothorax. The cephalothorax ovate in outline. The abdomen 3-segmented ; the segments and furca are in the proportional lengths as 40 : 22 : 19 : 19=100. The furcal rami 2 timed as long as wide. The rostrum slender and long.

The 1st antenna reaches back to the distal margin of the 2nd abdominal segment. The 5th pair of legs 4-jointed ; the distal segment has 3 long apical

setae; the 3rd segment has a minute spine on the distal outer margin; the 2nd segment has an outer marginal spine.

Male. Length, 3.12 mm. The specimen agrees well with the description and figures given by GIESBRECHT.

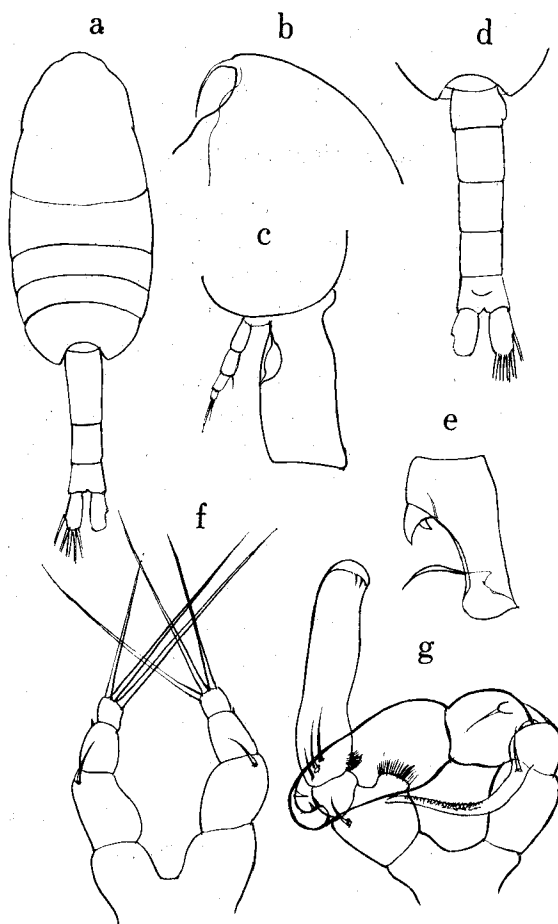


Fig. 154. *Metridia curticauda* GIESBRECHT.

Female: a, dorsal aspect; b, head, lateral aspect; c, last thoracic segment and genital segment, lateral aspect; d, last thoracic segment and abdomen, dorsal aspect; e, 1st joint of exopod of 2nd leg; f, 5th pair of legs. Male: g, 5th pair of legs.

Occurrence. Common in deep water of the Izu region.

Distribution. The species has a wide distribution in the Pacific, and Atlantic Oceans, also in the Malay Archipelago.

Metridia venusta GIESBRECHT

(Fig. 155, a-c)

Metridia venusta, GIESBRECHT, 1892, p. 340, t. 33, figs. 7, 17, 29; A. SCOTT, 1909, p. 112; SARS, 1925, p. 200; FARRAN, 1926, p. 271; SEWELL, 1932, p. 263; FARRAN, 1936, p. 110; TANAKA, 1937, p. 266.

Male. Length, 2.82 mm.

Remarks. No adult females have been obtained from the Izu region. The immature females measured 2.40-2.43 mm in total length. The 5th pair of legs of the immature female is composed of 2 free segments attached to the basal; the distal segment bears only 2 terminal setae as is figured by GIESBRECHT. A. SCOTT's or SARS' specimens have each 3 setae on the same segment.

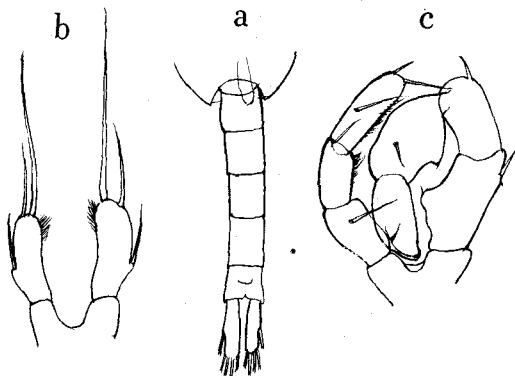


Fig. 155. *Metridia venusta* GIESBRECHT.
Female: a, 5th pair of legs. Male: b, abdomen, dorsal aspect; c, 5th pair of legs.

Occurrence. Common in the deep water of the Izu region.

Distribution. The species has a wide distribution in the Pacific and Atlantic Oceans, and also in the Malay Archipelago and Indian seas.

Metridia princeps GIESBRECHT

(Fig. 156, a-e)

Metridia princeps, GIESBRECHT, 1892, p. 340, t. 33, figs. 3, 18, 35, 40; A. SCOTT, 1909, p. 121; SEWELL, 1913, p. 354; SARS, 1925, p. 194; FARRAN, 1926, p. 271; 1929, p. 258; WILSON, 1932, p. 92; SEWELL, 1932, p. 252; JESPERSEN, 1934, p. 92; SEWELL, 1947, p. 167; BRODSKY, 1950, p. 301.

Female. Length, 7.34 mm: cephalothorax, 4.20 mm; abdomen, 3.14 mm; so the abdomen is contained 1.3 times in the length of the cephalothorax. The

abdominal segments and furca are in the proportional lengths as 42:22:12:24=100. The furcal rami 5 times as long as long as wide.

The 1st antenna exceeds the posterior margin of the furca by distal 3 segments. The mouth parts and swimming legs as described by GIESBEECHT.

Male. Length, 7.31mm: cephalothorax, 4.06mm; abdomen, 3.25mm. General appearance as in the female. The abdominal segments and furca are in the

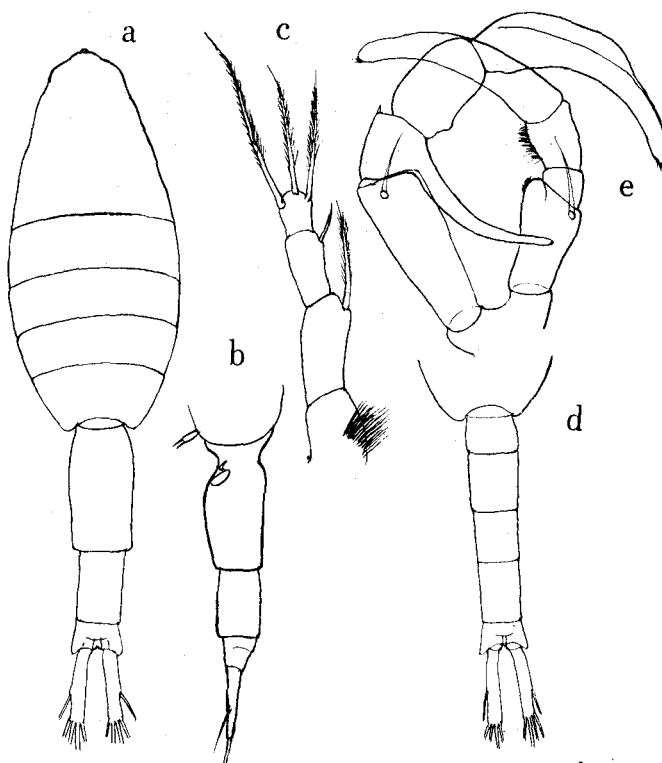


Fig. 156. *Metridia princeps* GIESBRECHT.

Female: a, dorsal aspect; b, abdomen, lateral aspect; c, 5th leg.
Male: d, abdomen, dorsal aspect; e, pair of legs.

proportional lengths as 11:19:17:19:9:25=100. The furcal rami 6 times as long as wide.

The right 1st antenna exceeds the end of the furca by last 2 segments. The left 1st antenna forms a grasping organ. The 5th pair of legs as figured by Sars.

Occurrence. 7 females and 4 males from the deep water of Sagami Bay.

Distribution. The species has a wide distribution in the Pacific and Atlantic Oceans, and also recorded from the American coast of the Pacific.

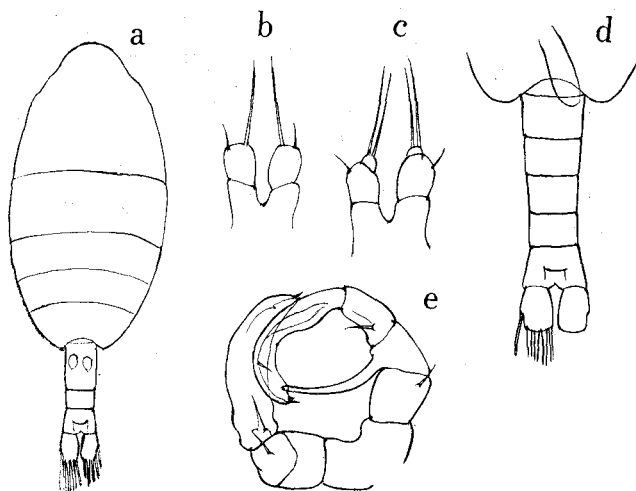
Metridia brevicauda GIESBRECHT

(Fig. 157, a-e)

Metridia brevicauda, GIESBRECHT, 1892, p. 340, t. 33, figs. 4, 15, 33; A. SCOTT, 1909, p. 120; FARRAN, 1926, p. 271; SEWELL, 1932, p. 248; WILSON, 1932, p. 118; JESPERSEN, 1934, p. 101; BRODSKY, 1950, p. 300.

Female. Length, 1.90 mm. The cephalothorax ovate and robust. The abdomen is contained 2.6 times in the length of the cephalothorax. The abdominal segments and furca are in the proportional lengths as 43:17:17:23=100.

The 1st antenna reaches back to the distal end of the furca. The 5th pair of legs shows some variations as shown in the figure.

Fig. 157. *Metridia brevicauda* GIESBRECHT.

Female: a, dorsal aspect; b, 5th pair of legs; c, 5th pair of legs, another specimen. Male: d, abdomen, dorsal aspect; e, 5th pair of legs.

Male. Length, 1.50 mm. The specimen agrees exactly with the description and figures given by GIESBRECHT.

Occurrence. 12 females and 3 males from the deep water of Sagami Bay.

Distribution. The species has been recorded from the deep water of the Atlantic and Indian Oceans and also from the Malay Archipelago.

Metridia okhotensis BRODSKY

(Fig. 158, a-d)

Metridia okhotensis, BRODSKY, 1950, p. 293, fig. 199; *Metridia longa*, TANAKA, 1953, p. 134.

Female. Length, 4.80 mm : cephalothorax, 3.04 mm ; abdomen, 1.76 mm. The

cephalothorax oblong ovate; the greatest width exceeds more than $\frac{2}{5}$ the length of the cephalothorax. The lateral corner of the last thoracic segment rounded. The abdominal segments and furca are in the following proportional lengths: $38:22:19:21=100$. The furcal rami more than 2.5 times as long as wide.

The 1st antenna short and curved, reaches back to the middle of the 3rd thoracic segment; the proportional lengths of the segments are as follows:

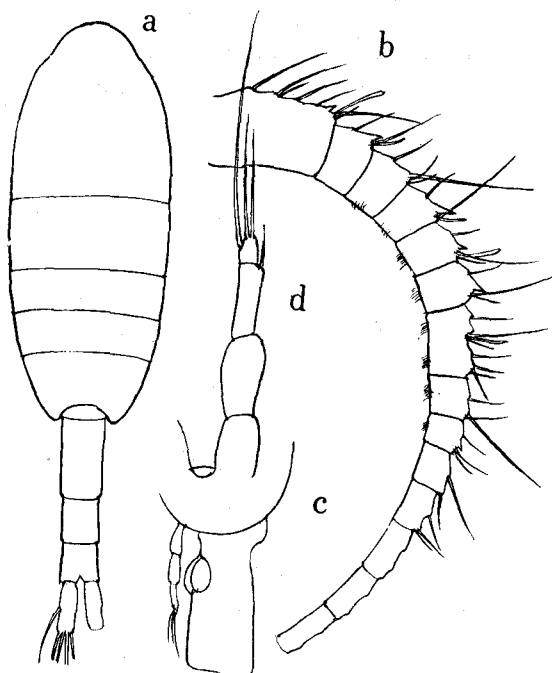


Fig. 158. *Metridia okhotensis* BRODSKY.

Female: a, dorsal aspect; b, 1st antenna; c, last thoracic segment and genital segment, lateral aspect; d, 5th leg.

Joint.	1	2	3	4	5	6	7-8	9	10	11	12	13	14
	98	32	32	32	32	32	53	25	32	32	32	39	42
Joint.	15	16	17	18	19	20	21	22	23	24	25		
	46	53	56	60	60	39	39	35	39	42	18	= 1000	

The total length of the 1st antenna measured 2.83 mm; the 1st, 2nd, 4th, 5th, 6th and 10th segments have each a small process on the anterior distal margin, of which those on the 2nd, 4th and 6th segments are comparatively acute.

The 5th pair of legs 4-jointed; the segments are in the proportional lengths, $29:32:27:12=100$. The distal segment bears 3 setae, of which the inner one

is the longest, about 8 times as long as the distal segment. The 2nd segment is devoid of outer distal seta.

Remarks. The present species is very closely allied to *M. longa* (Lubbock) but the broad cephalothorax, short abdomen and long distal segment of the 5th pair of legs distinguishes the present species from *M. longa*. The species appears to be a characteristic species of the North-west Pacific.

Occurrence. The species has been recorded in the Okhotsk Sea by Brodsky from the surface layer mixed with *M. longa*. Many females and males were obtained in the vertical hauls from 1000–0 m in Sagami Bay.

Distribution. The species is distributed in the Okhotsk Sea, and also in the deep water of Sagami Bay.

Metridia pacifica Brodsky

(Fig. 159, a–e)

Metridia pacifica, Brodsky, 1950, p. 295, fig. 201; *Metridia lucens*, Tanaka, 1953, p. 143.

Female. Length, 2.67–3.45 mm. The abdomen is contained 1.8 times in the length of the cephalothorax. The cephalothorax elongate ovate. The lateral corner of the last thoracic segment acutely produced. The greatest width of the cephalothorax slightly less than 1/3 the length of the cephalothorax. The abdominal segments and furca are in the proportional lengths as 42:23:15:20=100. The furcal rami 2.5 times as long as wide.

The 1st antenna extends to the posterior margin of the last thoracic segment. The segments are in the following proportional lengths:

Joint.	1	2	3	4	5	6	7–8	9	10	11	12	13	14
	130	32	32	28	32	28	53	28	35	35	35	37	42
Joint.	15	16	17	18	19	20	21	22	23	24–25			
	42	47	50	50	53	35	37	37	42	60	= 1000		

The 5th pair of legs 4-jointed. The proportional lengths of the segments as 40:32:20:8=100. In some specimens the distal 2 segments are incompletely fused.

Male. Length, 2.38 mm; cephalothorax, 1.48 mm; abdomen, 0.90 mm. General appearance as in the female. The abdominal segments and furca are in the following proportional lengths: 15:18:17:17:14:19=100. The furcal rami 2.5 times as long as wide.

The 5th pair of legs resembles that of *M. lucens* but the spiniform process on the antepenultimate segment of the right leg is much longer than the distal segment of the same leg.

Remarks. Brodsky described a species which allied closely to *M. lucens*

BOECK from the northern cold water of the Pacific under the name *M. pacifica*. The present species comes more closely to *M. pacifica* than to *M. lucens*. The species is characterized by the broad head, long genital segment, long furcal rami and slender 5th pair of legs in the female. The male 5th pair of legs differs in small details from that of *M. lucens*.

Occurrence. 51 females and 25 males from the deep water of Sagami Bay.

Distribution. The species appears to be distributed in the northern cold water of the North-west Pacific. It has been recorded by BRODSKY from the

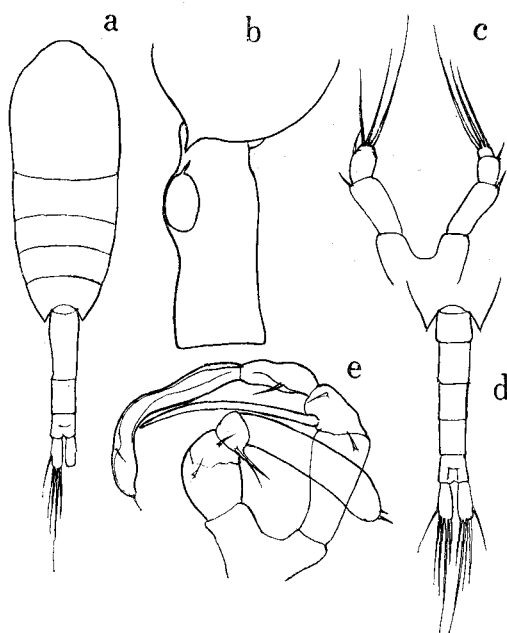


Fig. 159. *Metridia pacifica* BRODSKY.

Female: a, dorsal aspect; b, last thoracic segment and genital segment, lateral aspect; c, 5th pair of legs. Male: d, abdomen, dorsal aspect; e, 5th pair of legs.

North Pacific, Japan Sea and Behring Sea. The appearance of the species in the intermediate water of Sagami Bay will illustrate that the intermediate water of Sagami Bay has a close communication with the northern cold water of the North Pacific.

Genus *Pleuromamma* GIESBRECHT

A. SCOTT recorded the occurrence of *Pleuromamma abdominalis* (LUBBOCK), *P. gracilis* (CLAUS), *P. xiphias* (GIESBRECHT) from the Malay Archipelago. SEWELL obtained in the "Investigator" collection, in addition to the species recorded by A. SCOTT, two more species from the Indian seas, namely *P. indica*

WOLFENDEN and *P. quadrangulata* (DAHL). In Japanese waters four species have been recorded by MORI; they are *P. abdominalis*, *P. gracilis*, *P. xiphias* and *P. robusta*. I have detected in my collection the following species: *P. abdominalis*, *P. xiphias*, *P. gracilis* and *P. indica*. STEUER reported on the varieties and their distribution both horizontal and vertical of the genus *Pleuromamma* by the material of "Deutsche Tiefsee Expedition". *Pleuromamma abdominalis*, *P. gracilis* and *P. xiphias* appear to be distributed both in surface and deep layers, but *P. indica* has been obtained only from deep water. According to STEUER *P. indica* is a tropical form of the Indian Ocean and is distributed in the upper layer of the depth 200 m in the areas collected by "Valdivia". In the present collection *P. abdominalis*, *P. gracilis* and *P. xiphias* are distributed both in the surface and deep layers but *P. indica* has been obtained only from the deep water in the Izu region.

Pleuromamma abdominalis (LUBBOK)

Pleuromamma abdominalis, GIESBRECHT, 1892, p. 347, t. 5, fig. 8; t. 32, figs. 3, 5, 13, 22, 25-30 t. 33, fig. 43, 44, 48, 49, 52; *Pleuromamma abdominalis*, ESTERLY, 174; FARRAN, 1908, p. 61; A. SCOTT, 1909, p. 123; WOLFENDEN, 1911, p. 289; SEWELL, 1913, p. 354; SARS, 1925, p. 201; FARRAN, 1926, p. 272; 1929, p. 259; MORI, 1929, p. 175; WILSON, 1932, p. 123; SEWELL, 1932, p. 264; *P. abdominalis* f. *typica*, STEUER, p. 9; MORI, 1937, p. 69, pl. 34, figs. 6-9; pl. 35, figs. 6-7; JESPERSEN, 1934, p. 101; SEWELL, 1947, p. 168; BRODSKY, 1950, p. 212.

Female. Length, 3.18-3.39 mm. The abdomen is contained 2.6 times in length of the cephalothorax. The pigment spot on the right side. The genital segment swollen laterally, about as long as wide. The 1st antenna reaches back to the middle of the anal segment; the 1st segment has a curved spine; the 2nd segment with rather straight one on the anterior margin. The 5th pair of legs has 3 apical setae on the distal segment.

Male. Length, 3.00-3.37 mm. The pigment spot on the right side. The 2nd to 5th abdominal segments are furnished with protuberances furnished with brush of long hairs. The clasping antenna on the right side. The left antenna reaches back to the end of the 2nd abdominal segment. The right 5th leg is long; the left leg has a broad distal segment.

Occurrence. The species is frequent both in the surface and deep waters of the Izu region.

Distribution. The species has a world-wide distribution and has been recorded from the Atlantic, Indian and Pacific Oceans.

Pleuromamma xiphias GIESBRECHT

Pleuromamma xiphias, GIESBRECHT, 1892, p. 347, t. 32, fig. 14; t. 33, figs. 42, 45, 50; *Pleuromamma xiphias*, Esterly, 1905, p. 179; A. SCOTT, 1909, p. 124; WOLFENDEN 1911, p. 239; SARS, 1925, p. 202; WILSON 1932, p. 124; SEWELL, 1932, p. 269; STEUER, 1932, p. 5; MORI, 1937, p. 70, pl. 35, figs. 8-10; SEWELL, 1947, p. 169; BRODSKY, 1950, p. 308.

Female. Length, 4.31-5.75 mm. The frontal margin of the head pointed. The pigment spot on the left or right side. The abdomen is contained 2.5 times in the length of the cephalothorax. The genital segment is longer than wide. The 1st antenna has a curved spine on the anterior margin of the 1st segment; the 2nd, 4th, 5th and 6th segments have each a small spine on the anterior margin. The 5th pair of legs resembles that of *P. abdominalis*.

Male. Length, 3.94-4.45 mm. The pigment spot on the left side. The clasping antenna on the right side. The 5th pair of legs as in *P. abdominalis*.

Occurrence. Frequent both in the surface and deep layers.

Distribution. The species is widely distributed in the warm waters of the Indian, Pacific and Atlantic Oceans.

Pleuromamma gracilis (CLAUS)

Pleuromamma gracile, GIESBRECHT, 1892, p. 347, t. 5, fig. 7; t. 32, figs. 6, 18-20; t. 33, figs. 41, 47; *Pleuromamma gracilis*, A. SCOTT, 1909, p. 123; WOLFENDEN, 1911, p. 289; SATO, 1913, p. 35; SEWELL, 1913, p. 354; SARS, 1925, p. 204; FARRAN, 1929, p. 260; WILSON, 1932, p. 127; STEUER, 1932, p. 30; MORI, 1937, p. 71, pl. 35, figs. 1E5; TANAKA, 1937, p. 267; *Pléurommma piseki*, FARRAN, 1937, p. 111; BRODSKY, 1950, 308, fig. 214.

Remarks. I have reported in the previous paper two forms of this species under the name *P. gracilis* and *P. piseki*. STEUER (1932) distinguished three varieties, namely, forma *minima*, forma *piseki* and forma *maxima*. Forma *piseki* is easily distinguished from the others by the shape of the anal segment parallel on either side of the lateral margin of the anal segment. In forma *maxima* the anal segment is more swollen ventrally than in forma *minima*; the 5th pair of legs of the female has the demarcation between the 2nd basal and the expod.* Forma *minima* is relatively small in size and has the genital segment less swollen and the anal segment less divergent. In my collection two of these forms have been obtained, namely, forma *minima* and forma *piseki*; the former measured 1.88-1.90 mm, and the latter 2.09-2.15 mm in total length. These two forms have been collected both from the surface and deep layers in about the same quantities. *P. gracilis* has a wide distribution in the Atlantic, Indian and Pacific Oceans. The forma *maxima* has been recorded only from the south of Africa in the Westwinddrift.

Pleuromamma indica WOLFENDEN

(Fig. 160, a-e)

Pleuromamma indica, WOLFENDEN, 1905, p. 1011, pl. 96, figs. 24, 25, 26, 31, 32, 33; SEWELL, 1932, p. 264, text-fig. 89; STEUER, 1932, p. 17, text-fig. 52-68; SEWELL, 1947, p. 168; TANAKA, 1953, p. 134.

Female. Length, 2.20-2.41 mm: cephalothorax, 1.56 mm; abdomen, 0.64 mm.

The abdomen is contained 2.4 times in the length of the cephalothorax. The abdominal segments and furca are in the proportional lengths as 47:21:16:16 = 100. The pigment spot on the left side.

The 1st antenna extends to the posterior margin of the genital segment; the segments are in the following proportional lengths:

Joint.	1	2	3	4	5	6	7-8-9-10	11	12	13	14
	82	25	21	25	25	15	107	41	37	45	49
Joint.	15	16	17	18	19	20	21	22	23	24	25
	49	53	58	58	62	41	41	41	49	45	21 = 1000

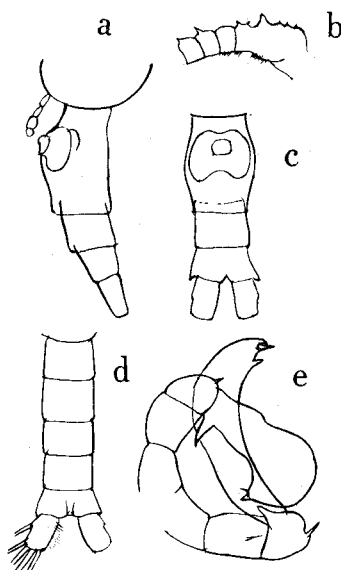


Fig. 160. *Pleuromamma indica* SEWELL.
Female: a, abdomen, lateral aspect; b, basal part of 1st antenna; c, abdomen, lateral aspect. Male: d, abdomen, dorsal aspect; e, 5th pair of legs.

The 1st segment of the 1st antenna has a short and straight spine on the anterior distal margin. For comparison the proportional lengths of the segments of the 1st antenna in *P. abdominalis* are given:

Joint.	1	2	3	4	5	6	7-8-9-10	11	12	13	14
	95	15	20	23	26	24	98	48	38	53	56
Joint.	15	16	17	18	19	20	21	22	23	24	25
	59	59	59	56	59	38	35	38	47	41	18 = 1000

P. abdominalis has the 16th segment slightly longer in proportion to that of *P. indica*. The other appendages generally as those of *P. abdominalis*.

Male. Length, 1.96 mm: cephalothorax, 1.28 mm; abdomen, 0.68 mm. The pigment spot on the right side. In the 2nd leg the 1st segment of the endopod notched on the left side.

Occurrence. 39 females and 20 males from the deep water of Sagami Bay, Nov. 1937.

Distribution. The species has been recorded from the Indo-Pacific and southern Atlantic. The occurrence of the species in the North Pacific will indicate the intercommunication of waters between the North Pacific and the southern Atlantic.

Genus *Gaussia* WOLFENDEN

WOLFENDEN (1905) created the genus to accommodate a species closely related to *Metridia* under the name *Gaussia melanotica* which was afterward revealed to be identical with *Pleuromamma princeps* described by T. SCOTT. In 1897 GIESBRECHT described the same species under the name *Metridia scotti*. WOLFENDEN in his report on the copepoda of the "Deutsche Süd-Polar Expedition" recorded the occurrence of the same species under the name *Gaussia scotti*. At present the genus comprises only a single species *G. princeps* (T. SCOTT). ESTERLY recorded the occurrence of a species belonging to this genus under the name *Metridia atra* from the Pacific coast, which is according to SEWELL a variety of *Gaussia princeps*. Up to the present time I have failed to find any of the species of this genus from the Izu region. BRODSKY recorded the occurrence of *G. princeps* from the far eastern and polar seas of the U.S.S.R.

Family LUCICUTIIDAE

Genus *Lucicutia* GIESBRECHT

A. SCOTT recorded the occurrence of seven species of the genus *Lucicutia* from the Malay Archipelago, namely, *Lucicutia flavicornis* (CLAUS), *L. clausi* (GIESBRECHT), *L. bicornuta* WOLFENDEN, *L. longiserrata* (GIESBRECHT), *L. maxima* STEUER, *L. philyra* A. SCOTT and *L. pera* A. SCOTT. SEWELL (1912, 13) recorded *L. flavicornis* from the coast of southern Burma, and *L. bicornuta*, *L. clausi* and *L. maximma* from the Bay of Bengal. He also recorded in the "Investigator" collection the occurrence of *L. clausi*, *L. ovalis* WOLFENDEN, *L. bicornuta*, *L. challengerii* SEWELL, *L. flavicornis* and *L. maxima*. In Japanese waters MORI recorded two species, *L. ovalis* and *L. flavicornis* from the surface layer. I have been able to find the following species from the Izu region: *L. ovalis*, *L. longiserrata*, *L. macrocera* SARS, *L. magna* WOLFENDEN, *L. clausi*, *L. flavicornis*,

L. curta FARRAN *L. lucida* FARRAN *L. wolfendeni*, *L. maxima* STEUER, *L. bicornuta* WOLFENDEN *L. pera* A. SCOTT, *L. sewelli* and *L. longispina*. The last two species appear to be new to science.

There have been some confusions regarding the identification of the species of this genus. *L. grandis* described by GIESBRECHT from the Pacific Ocean differs, as SEWELL pointed out, from *L. grandis* taken in the Atlantic and described by WOLFENDEN. According to SEWELL the form described by WOLFENDEN or by SARS is not identical with *L. grandis* GIESBRECHT. In my collection I found WOLFENDEN's form which differs distinctly from GIESBRECHT's original specimen of *L. grandis*, and I followed the SEWELL's proposal in giving the former species the name *L. wolfendeni*. According to SEWELL *L. maxima* described by SARS differs from those described by STEUER or by A. SCOTT and also from that described by SEWELL. The male specimen of *L. maxima* described by SARS distinctly differs from that described by A. SCOTT under the same name. This was ascertained by examining the male specimen of *L. maxima* taken from the deep water of the Izu region. In 1925 SARS described a form which he believed to be identical with *L. lucida* FARRAN. I found two male examples which resemble closely *L. lucida* FARRAN. One of which agrees exactly with the male originally described by FARRAN under the name *L. lucida*; the another with that described by SARS under the same name. Comparing these two male examples there are certain differences between these example in the structure of the 5th pair of legs. The male described by SARS under the name *L. lucida* appears to be the male of *L. pera* A. SCOTT. The female specimen of *L. longiserrata* described by SARS is clearly distinct from the originally described by GIESBRECHT under the same name in having 3-jointed endopod in the 1st leg. *L. longiserrata* GIESBRECHT has 2-jointed endopod in the 1st leg. SARS' female specimen is identical with *L. curta* FARRAN.

Lucicutia ovalis WOLFENDEN

Lucicutia ovalis, WOLFENDEN, 1911, p. 319; FARRAN, 1929, p. 263; 1936, p. 112; MORI, 1937, p. 72, pl. 36, figs. 6-13; WILSON, 1950, p. 256.

Female. Length, 1.42-1.49 mm. The cephalothorax robust and oval in dorsal view. The abdomen is contained about 2 times in the length of the cephalothorax. The genital segment longer than the combined length of the next 2 segments. The furcal rami shorter than the combined length of the 3 preceding segments. The longest furcal seta about as long as the combined length of the abdominal segments and furca.

The 1st antenna exceeds the end of the abdomen by last 2 segments. The 1st leg has 2-jointed endopod. In the 5th pair of legs the endopod does not exceed the middle of the 2nd segment of the exopod; the apical spine of the exopod short.

Male. Length, 1.37 mm. General appearance as in the female. The combined length of the abdominal segments and furca is contained 2-times in the length of the cephalothorax. The furcal rami about as long as the combined length of the 1st and 2nd abdominal segments.

The right 1st antenna forms a clasping organ, and reaches back to the middle of the furca; the segments 19-21 are longer than the segments 22-23.

In the 5th pair of legs the inner margin of the 2nd basal segment of the right leg straight and has no hairs on the inner margin. The left leg has an inner marginal process carrying 2 denticles on the 2nd basal segment.

Occurrence. 3 females and 1 male from the surface layer of Sagami Bay, December, 1933.

Distribution. The species has been recorded from the tropical Atlantic, and Indian Oceans; also recorded from the Pacific coast of Middle Japan and East China Sea.

Lucicutia sewelli sp. nov.

(Fig. 161, a-f)

Male. Length, 3.77 mm: cephalothorax, 2.45 mm; abdomen, 1.32 mm; so the abdomen is contained 1.9 times in the length of the cephalothorax. The cephalothorax oblong ovate. The rostrum bifurcates with a slender filament at each distal end.

The abdomen 5-jointed; the segments and furca in the proportional lengths as 10:9:9:7:15:50=100. The furca slightly asymmetrical; the rami slender, about 10 times as long as it is wide at the distal end (75:7).

The 1st antenna 25-jointed on the right side; the left side with 21 free segments; the proportional lengths of the segments as follows:

Joint.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	58	12	18	20	22	22	22	22	22	25	27	32	43	47
Joint.	15	16	17	18	19	20	21	22	23	24	25			
	49	58	63	68	74	63	54	56	56	45	22 = 1000	(Right)		
Joint.	1-2	3	4	5	6	7	8	9	10	11	12	13	14	
	73	23	23	27	27	27	30	25	27	17	30	39	43	
Joint.	15	16	17	18	10-20-21		22-23		24	25				
	55	64	66	62	118		132		57	27 = 1000	(Left)			

The 2nd antenna has the exopod 1.2 times as long as the endopod; the exopod 8-jointed; the segments 1 to 8 bear each a single inner marginal seta; the 8th segment bears 4 distal setae; the 1st segment of the endopod bears hair-like spines on the distal half of the outer margin; the 2nd segment has

7 setae on the outer lobe, 9 setae on the inner lobe. The mandible has the 2nd basal segment carrying 4 setae; the teeth plate is furnished with rows of minute spinules at the base of the 4th to 8th teeth; the exopod about 1.3 times as long as the endopod (24:19). The 1st maxilla has 6 long and 5 short setae on the exopod: the endopod has 5 setae on the distal segment; 4 setae on the 1st segment; the 2nd basal has 3 setae; the 2nd and 3rd inner lobes have each 3 setae; the outer lobe has 5 long setae; the 1st inner lobe has 13 setae. In

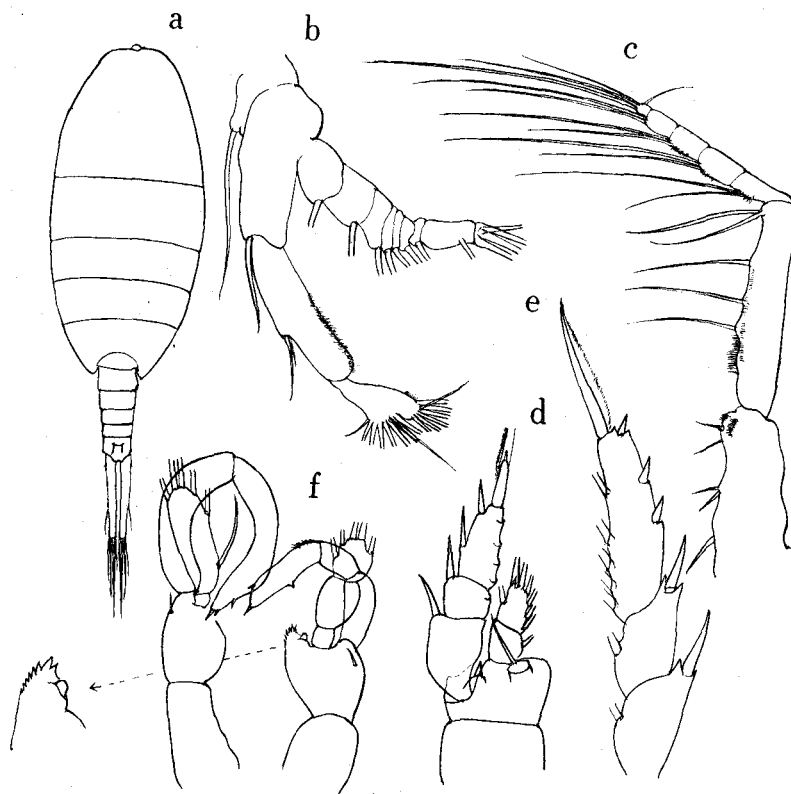


Fig. 161. *Lucicutia sewelli*, sp. nov.

Female: dorsal aspect; b, 2nd antenna; c, maxilliped; 2nd leg; d, 1st leg; e, 2nd leg. Male: f, 5th pair of legs.

the 2nd maxilla the 1st lobe has 5 setae; the 2nd to 5th lobes have each 3 setae; the 6th lobe has 2 setae; the endopod has 6 setae. The maxilliped has a short 1st basal and a long 2nd basal; the proportional lengths of the basal segments and exopod are as follows: 20:55:43; the 1st basal has on its anterior margin 1 seta on the 2nd lobe; 2 setae on the 3rd lobe; the 4th lobe has beside 2 setae, rows of small spinules on the anterior distal margin; the 2nd basal has 3 setae on the anterior margin and 2 setae on the distal margin;

the endopod 1 to 4 have each 2 long setae respectively; the distal segment of the endopod has 3 terminal and 1 outer marginal setae; the 1st to 3rd segments of the endopod are furnished with fine short hairs on the anterior distal margin.

The 1st leg has 2-jointed endopod; the 2nd basal has a process of moderate size on the posterior surface near the base of the exopod, and a cylindrical process on the inner distal margin; the terminal spine of the exopod of the right leg has a small spine based on the process at the proximal 1/3 of the terminal spine. The 2nd to 4th legs have each 3-jointed exopod and endopod; the proportional lengths of the 3rd segment of the exopod to terminal spine of the exopod in the 1st to 4th legs as follows: 1st, 20:34; 2nd, 45: (broken off); 3rd, 56:31; 4th, 54:27.

In the left 5th leg the 2nd basal segment is produced on the inner distal corner and is furnished with denticles, 9 in number, and a rounded process; in the right leg the 2nd basal is internally swollen.

Remarks. The specimen resembles closely *Lucicutia tenuicauda* Sars in having long furca, but can be distinguished from it in its small size, in the peculiar structure of the terminal spine in the exopod of the right 1st leg, and a pointed process on the 2nd basal segment of the same leg. The right 5th leg has a rounded inner margin on the 2nd basal segment in the present specimen, whereas, it is convex in *L. tenuicauda*. The specimen comes also near to *L. profunda* BRODSKY but can be distinguished from it in having a long furcal ramus about as long as the combined length of five abdominal segments.

Occurrence. One male specimen from the deep water of Sagami Bay, October, 1938.

Distribution. Deep water of the Izu region.

Lucicutia longispina sp. nov.

(Fig. 162, a-f)

Female. Length, 2.81 mm: cephalothorax, 1.86 mm; abdomen, 0.95 mm; so the abdomen is contained 2 times in the length of the cephalothorax. The cephalothorax moderately robust. The lateral corner of the last thoracic segment narrowly rounded. The rostral papilla not visible from the dorsal.

The abdominal segments and furca in the proportional lengths as 28:10:8:11:43=100. The furcal rami symmetrical, equal in length to half the length of the abdomen, and 7 times as long as wide; the 2nd furcal seta about as long as the combined length of the abdominal segments.

The 1st antenna 25-segmented, exceeds the end of the furca by terminal 4 segments; the segments are in the following proportional lengths:

Joint.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	57	13	15	20	23	23	23	26	26	26	31	31	44	46
Joint.	15	16	17	18	19	20	21	22	23	24	25			
	51	57	62	67	69	59	51	54	57	49	20 = 1000			

The 2nd antenna with the endopod 1.2 times as long as the exopod. The mandible with the exopod 1.3 times as long as the endopod; the 2nd basal with 3 marginal setae. The 1st maxilla has 5 setae on the outer lobe, 11 on

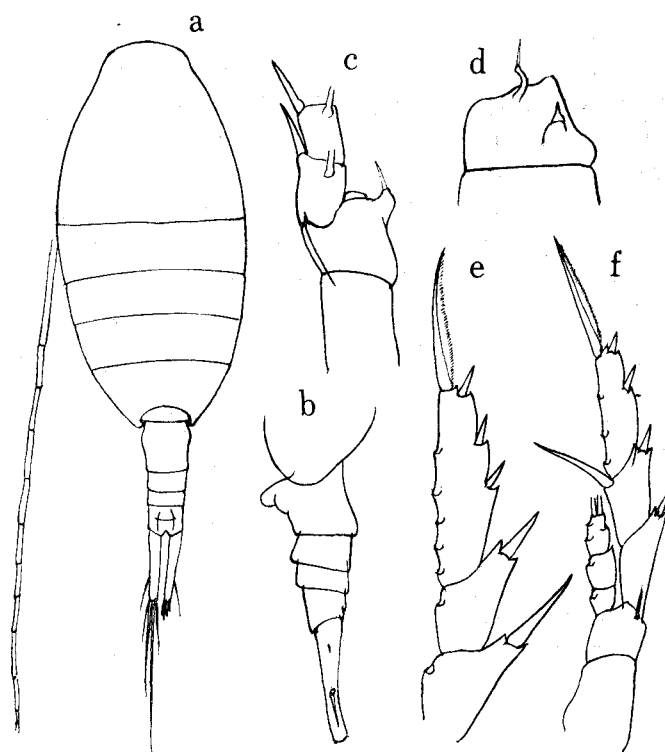


Fig. 162. *Lucicutia longispina* sp. nov.

Female: a, dorsal aspect; b, last thoracic segment and abdomen, lateral aspect; c, 1st leg; d, 2nd basal segment of 1st leg; e, exopod of 2nd leg; f, 4th leg.

the exopod, 9 on the endopod, 3 on the 2nd basal. The 2nd maxilla has no characteristic features. The maxilliped has a long 2nd basal; the inner margin of the segment is furnished with rows of hair-like spines: The proportional lengths of the basal segments and endopod are as 30:40:32.

The 1st leg unfortunately broken off in the endopod; the 2nd basal segment has a moderately long and slightly twisted process on the distal corner in anterior aspect; the segment is also furnished with a pointed process on the

posterior surface near the base of the exopod; the terminal spine of the exopod is longer than the combined length of the distal 2 segments of the exopod. The 2nd leg with a long outer edge spine on the 1st segment of the exopod, and extends beyond the base of the outer edge spine on the 2nd segment; the terminal spine about $\frac{2}{3}$ the length of the 3rd segment of the exopod. In the 3rd and 4th legs the terminal spine of the exopod about half the length of the 3rd segment of the exopod of the respective legs. The 5th pair of legs has the terminal spine of the exopod as long as the 3rd segment of the exopod; the inner edge spine on the 2nd segment of the exopod extends to the base of the 3rd inner marginal seta of the 3rd segment of the exopod.

Remarks. The present specimen is characterised by its long 1st antenna and long terminal spine of the exopod of the 5th pair of legs. *L. tenuicauda* SARS and *L. intermedia* SARS have each a long terminal spine on the exopod of the 5th pair of legs but the 1st antenna is short. *L. macrosera* SARS has a long 1st antenna but the terminal spine of the exopod of the 5th pair of legs is short, and the length of the furcal rami differ in the proportion from that of the present specimen. The specimen comes also near to *L. pacifica* BRODSKY and *L. polaris* BRODSKY in having a long 1st antenna but can be distinguished from them by the long terminal spine on the exopod of the 5th pair of legs in the present specimen.

Occurrence. One female specimen from the deep water of Sagami Bay.

Distribution. Deep water of the Izu region.

Lucicutia longiserrata (GIESBRECHT)

(Fig. 163, a-h)

Leuckartia longiserrata, GIESBRECHT, 1872, p. 359, t. 19, figs. 18, 25; t. 38, fig. 36; *Lucicutia loniserrata*, FARRAN, 1908, p. 64; A. SCOTT, 1909, p. 127; JESPERSEN, 1934, p. 105; WILSON, 1950, p. 256. (non *Lucicutia longiserrata*, SARS, 1925).

Female. Length, 2.52 mm: cephalothorax, 1.79 mm; abdomen, 0.73 mm. The cephalothorax ovate. The frontal margin of the head bluntly rounded. The rostrum with slender filaments.

The abdominal segments and furca in the proportion lengths as 31:10:10:17:32=100. The genital segment with a large pointed protuberance on the genital opening. The furcal rami 4-times as long as it is wide at the proximal.

The 1st antenna 25-jointed, exceeds the posterior margin of the furca by last 2 segments; the segments are in the following proportional lengths:

Joint.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	54	11	16	16	19	19	22	22	22	25	29	29	45	48
Joint.	15	16	17	18	19	20	21	22	23	24	25			
	51	61	64	70	70	59	54	57	57	54	25 = 1000			

The 2nd antenna with the endopod about 1.3 times as long as the exopod. The mandible with the exopod about 1.3 times as long as the endopod. The 1st maxilla with 5 setae on the outer lobe, 11 on the exopod, 9 on the endopod, 3 on the 2nd basal, 3 on the 3rd inner lobe. The 2nd maxilla as those of the other member of the genus. The maxilliped has the basal segments and endopod in the proportional lengths, 27:31:26.

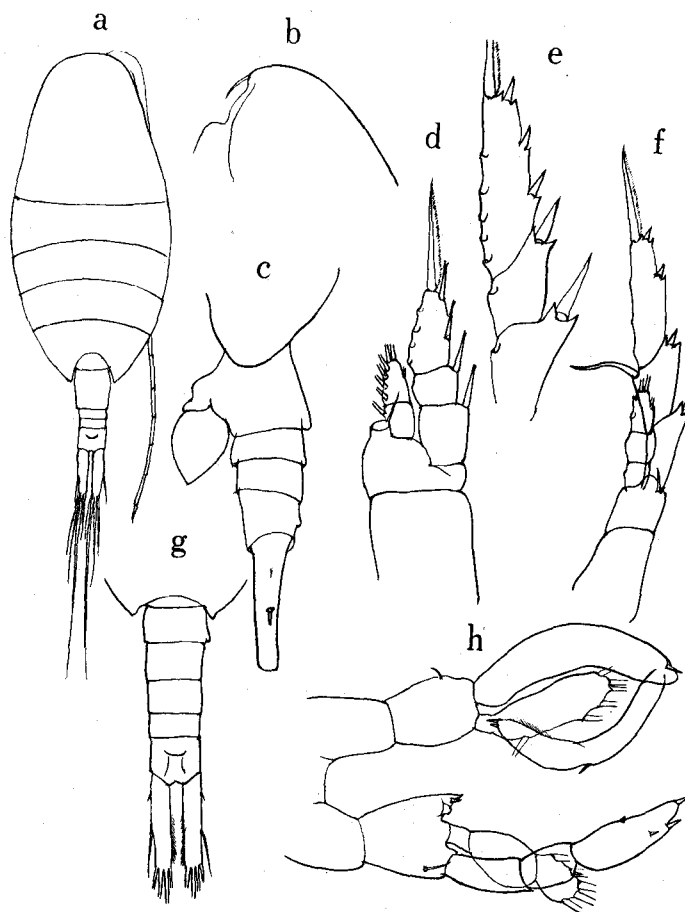


Fig. 163. *Lucicutia longiserrata* (GIESBRECHT).

Female: dorsal aspect; b, head lateral aspect; c, last thoracic segment and abdomen, lateral aspect; d, 1st leg; e, exopod of 2nd leg; f, 5th leg. Male: g, abdomen, dorsal aspect; h, 5th pair of legs.

The 1st leg with 2-jointed endopod. The 2nd leg has a strong outer edge spine on the 1st segment of the exopod; the terminal spine of the exopod slightly curved. In the 2nd to 5th legs the proportional lengths of the terminal spine of the exopod to the 3rd segment of the exopod are as follows: 2nd leg,

20:34; 3rd leg, 18:38; 4th leg, 17:38; 5th leg, 19:23. According to GIESBRECHT's figure the proportional lengths of the segments in the 5th leg are 21:24. The 5th pair of legs has a slender inner marginal spine on the 2nd segment of the exopod reaching the middle of the next segment.

Male. Length, 1.88 mm. The abdomen is contained 2.2 times in the length of the cephalothorax. General appearance as in the female except the slender cephalothorax which is 1.7 times as long as wide.

The abdominal segments and furca in the proportional lengths as 13:13:13:9:14:38=100. The furcal rami 4.6 times as long as it is broad at the distal end; the 2nd furcal seta 1.6 times as long as the abdomen.

The right 1st antenna exceeds the end of the furca by distal one segment. The grasping antenna on the left side; the segments are in the following proportional lengths:

Joint.	1-2	3	4	5	6	7	8	9	10	11	12	13	14
	84	15	20	25	25	25	20	25	25	30	33	44	39

Joint.	15	16	17	18	19-20-21	23-23	24	25
	59	64	69	64	94	134	64	33 = 1000

The 1st leg with 2-jointed endopod; the proportional lengths of the terminal spine of the exopod to the segments of the exopod are as 19:10 (1st):6 (2nd):9 (3rd).

In the 5th pair of legs the 2nd basal segment is slightly produced about the middle of the outer margin; the same segment of the left leg is produced on the inner distal edge and is furnished with 2 teeth and a small seta at the apex, and a rounded process near the base of the endopod.

Remarks. GIESBRECHT's specimen measured 2.2 mm. FARRAN's specimen measuring 3.3 mm has the tubular process on the 2nd basal of the 1st leg not so long as is shown in GIESBRECHT's figure. The present specimen has a low process as is observed in FARRAN's specimen. The species described by SARS under the name *L. longiserrata* having 3-jointed endopod in the 1st leg is not identical with *L. longiserrata* (GIESBRECHT) but identical with *Lucicutia curta* FARRAN.

Occurrence. 2 females and 1 male from deep water of the Izu region.

Distribution. The species has been recorded from the Pacific, Atlantic and also from the Malay Archipelago.

Lucicutia macrocera SARS

(Fig. 164, a-f)

Lucicutia macrocera, SARS, 1925, p. 213, pl. 62, figs. 1-5; JESPERSEN, 1934, p. 105; WILSON, 1950, p. 256.

Female. Length, 3.34 mm : cephalothorax, 2.11 mm ; abdomen, 1.23 mm. The cephalothorax moderately robust. The abdominal segments and furca are in the proportional lengths as 30:10:12:16:32=100. The genital segment with a conical process on the genital opening. The furcal rami 6 times as long as it is wide at the distal ; the rami not divergent.

The 1st antenna 25-jointed, exceeds the end of the furca by last 7 segments ; the proportional lengths of the segments are as follows :

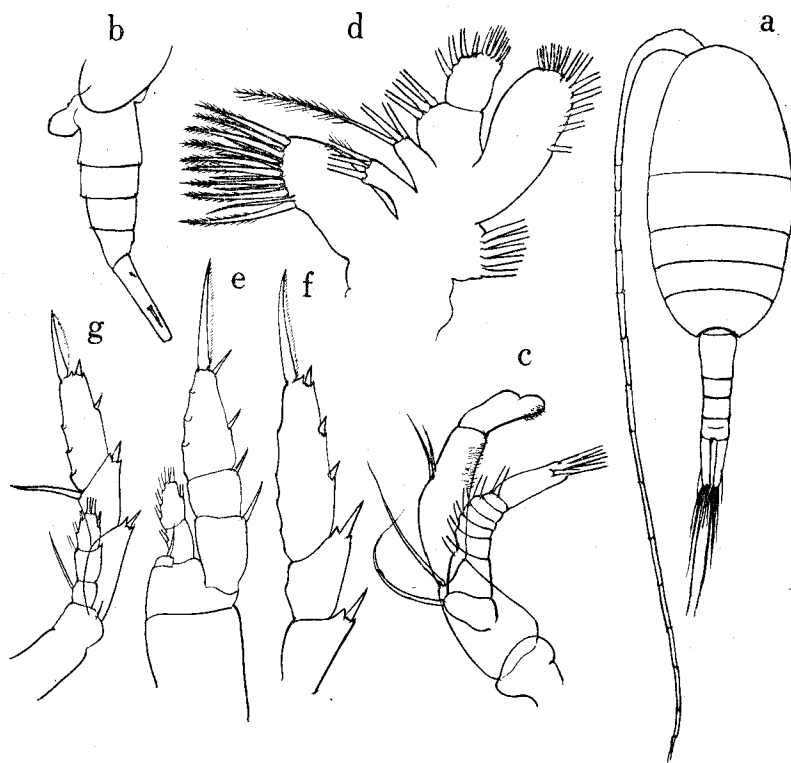


Fig. 164. *Lucicutia macrocera* Sars.

Female: a, dorsal aspect ; b, abdomen, lateral aspect ; c, 2nd antenna ; d, 1st maxilla ; e, 1st leg ; f, exopod of 2nd leg ; g, 5th leg.

Joint.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	45	12	15	18	21	21	21	24	24	17	30	30	48	54
Joint.	15	16	17	18	19	20	21	22	23	24	25			
	57	63	60	69	66	60	52	57	57	45	24 = 1000			

The 2nd antenna with the exopod slightly longer than the endopod (21:18) ; the exopod 9-jointed ; the segments 1 to 8 have each a marginal seta ; the segment 9 has 3 distal setae ; the endopod 2-jointed ; the 1st basal segment

bears on its inner margin a row of needle-like spines. The mandible with the exopod slightly longer than the endopod. The 1st maxilla has the masticatory lobe with 9 stout spines and 5 smaller ones; lobe 2, lobe 3 and 2nd basal segment have each 3 setae; the exopod large, bears 11 setae; the endopod bears 9 setae. The 2nd maxilla as those of the other member of the genus. The maxilliped as in the foregoing species; the 1st basal segment is slightly shorter than the 2nd; the endopod as long as the 2nd basal.

The 1st leg with 2-jointed endopod; the 2nd basal has a cylindrical process on the inner distal margin. The 2nd leg has the outer edge spine on the 1st segment of the exopod, which is of equal in length to that of the 2nd segment of the exopod.

The 5th pair of legs has a slender inner marginal spine on the 2nd segment of the exopod; the terminal spine of the exopod about $\frac{2}{3}$ the length of the 3rd segment of the exopod.

Remarks. *Lucicutia macrocera* SARS and *Lucicutia magna* WOLFENDEN have each a long 1st antenna exceeding much beyond the end of the furca. The present specimen resembles the former in having a long 1st antenna, in the proportional lengths of the abdomen and furca, and in the structure of the 5th pair of legs. But differs slightly from *L. macrocera* described by SARS in its robust cephalothorax and non-divergent furca. SARS' specimen measured 3.30 mm in total length.

Occurrence. One female in the vertical hauls from 1000-0 m, and one female from the depth 1200 to surface in Nov. 1937 in Sagami Bay.

Distribution. The species has been recorded from the temperate Atlantic by SARS, and from the south of Davis Strait by JESPERSEN.

Lucicutia magna WOLFENDEN

(Fig. 165, a-f)

Lucicutia magna, WOLFENDEN, 1904, p. 121; *L. gracilis* SARS, 1905, p. 8; *L. atlantica*, FARRAN, 1905, p. 44; *L. magna*, FARRAN, 1908, p. 62; *L. atlantica*, SARS, 1925, p. 217, pl. 59, figs. 1-5; *L. magna*, FARRAN, 1926, p. 276; 1929, p. 264; WILSON, 1932, p. 130; *L. atlantica*, JESPERSEN, 1934, p. 105; SEWELL, 1949, p. 174.

Female. Length, 3.60 mm: cephalothorax, 2.13 mm; abdomen, 1.47 mm; so the abdomen is contained 1.4 times in the length of the cephalothorax. The cephalothorax elongate ovate, contracts towards posterior end. The head has, when viewed from the lateral, a dorsal swelling on the posterior margin at the junction with the 1st thoracic segment.

The abdomen 4-segmented, the segments and furca are in the proportional lengths as 27:17:14:13:29=100. The genital segment has a protuberance on the posterior margin of the genical orifice. The furcal ramus slightly longer on the left side than on the right, and about 5 times as long as wide.

The 1st antenna exceeds the end of the furca by distal 5 segments. The mouth parts as those of the other member of the genus.

The 1st leg with 2-jointed endopod; the 2nd basal segment has a cylindrical process on the inner distal angle. In the 2nd leg the 1st segment of exopod has an outer edge spine reaching the middle of the next segment; the terminal spine of the exopod longer than half the length of the 3rd segment of the exopod (19:35).

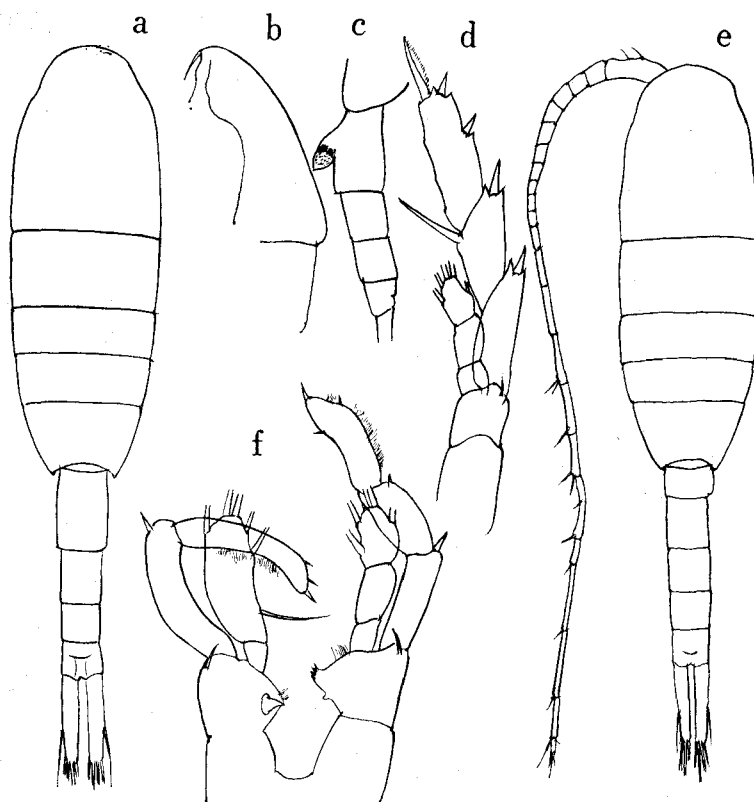


Fig. 165. *Lucicutia magna* WOLFENDEN.

Female: a, dorsal aspect; b, head, lateral aspect; c, abdomen, lateral aspect; d, 5th leg. Male: dorsal aspect, f, 5th pair of legs.

The 5th pair of legs has the terminal spine of the exopod which is half the length of the 3rd segment of the exopod (13:27).

Male. Length, 3.15-3.43 mm: cephalothorax, 2.00 mm; abdomen, 1.15 mm. General appearance as in the female; the greatest width of the cephalothorax measured 0.73 mm. The abdominal segments and furca are in the proportional lengths as 11:18:16:14:10:31=100. The furcal rami 5 times as long as wide.

The 1st antenna exceeds the end of the furca by distal 4 segments; the left side forms a grasping organ.

In the 5th pair of legs the right leg has an acute process on the inner margin of the 2nd basal segment about the middle; the same segment of the left leg is produced triangularly on the middle of the inner margin, and is furnished with 4 denticles on the apex and a small process about the middle of the proximal half of the inner margin.

Remarks. According to WOLFENDEN the terminal spine of the exopod of the 2nd leg in the female is $\frac{1}{3}$ the length of the 3rd segment of the exopod, whereas, in the present specimen it is a little longer than half the length of the 3rd segment. The terminal spine of the exopod of the 5th pair of legs is, according to SARS' figure, much shorter than half the length of the 3rd segment of the exopod, whereas, it is about half the length of the 3rd segment in the present specimen. In the male specimen the left 5th leg differs from that figured by SARS; the inner margin of the 2nd basal segment is produced triangularly and pointed at the apex.

Occurrence. 6 females and 3 males from the depth 1000 in Sagami and Suruga Bays.

Distribution. The species has been recorded from the Atlantic, Antarctic and Mediterranean.

Lucicutia clausi (GIESBRECHT)

(Fig. 166, a-f)

Leuckartia clausi. GIESBRECHT, 1892, p. 359, t. 19, figs. 5, 6, 12-14, 24, 27; t. 38, fig. 37; *Lucicutia clausi*, A. SCOTT, 1909, p. 126; SEWELL, 1913, p. 354; FARRAN, 1929, p. 263; 1936, p. 112; SEWELL, S/1929, p. 289; SARS, 1925, p. 208; WILSON, 1950, p. 255.

Female. Length, 1.75 mm: cephalothorax, 1.14 mm; abdomen, 0.61 mm. The head has a lateral spine on each side. The abdominal segments and furca are in the proportional lengths as 26:12:12:18:32=100. The genital segment considerably swollen below with a process on the genital orifice. The furcal rami about 3 times as long as wide.

The 1st antenna extends about to the end of the furca.

The 1st leg with 2-jointed endopod. The 5th pair of legs has a very short terminal spine on the 3rd segment of the exopod, about $\frac{1}{3}$ the length of the 3rd segment of the exopod.

Male. Length, 1.86 mm: cephalothorax, 1.07 mm; abdomen, 0.79 mm. General appearance as in the female. The 5th pair of legs as the figures given by GIESBRECHT.

Occurrence. 5 females and 3 males from Suruga Bay in the vertical hauls from 1000 to surface, December, 1937.

Distribution. The species has been recorded from the Pacific, Atlantic, and Indian Oceans also from the Malay Archipelago and Mediterranean Sea.

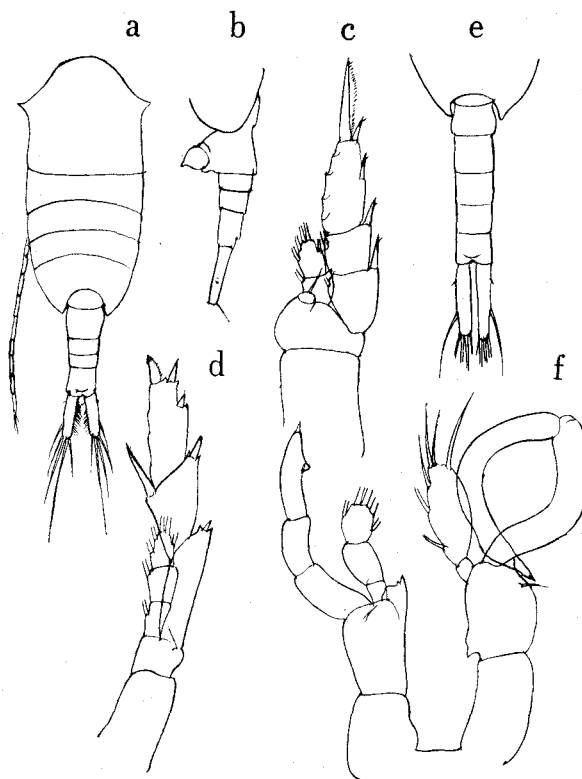


Fig. 166. *Lucicutia clausi* (GIESBRECHT).

Female: a, dorsal aspect; b, abdomen, lateral aspect; c, 1st leg; d, 5th leg. Male: e, abdomen, dorsal aspect; f, 5th pair of legs.

Lucicutia flavicornis (CLAUS)

(Fig. 167, a-b)

Leuckartia flavicornis, CLAUS, 1863, p. 183; GIESBRECHT 1892 p. 359 t. 5, fig. 84; t. 19 figs. 2, 3, 15-17, 213, 29, 38; t. 38 figs. 38, 40 *Lucicutia flavicornis*, ESTERLY, 1905, p. 180; FARRAN 1908, p. 64; A. SCOTT, 1909, p. 126; WOLFENDEN 1911, p. 323; SEWELL, 1912, p. 366; 1914, p. 228; SARS, 1925, p. 207; FARRAN 1926 274; 1929, p. 262; SEWELL, 1932, p. 294; FARRAN, 1936, p. 111; MORI, 1937, p. 72 pl. 37 figs. 1-6; SEWELL, 1947, p. 174; BRODSKY, 1950, p. 327; WILSON, 1950, p. 327; TANAKA 1960, p. 52.

Female. Length, 1.46-1.65 mm. The cephalothorax oval in outline. The abdomen is contained about 1.5 times in the length of the cephalothorax. The

abdominal segments and furca are in the proportional length as 31:13:9:9:38=100 in the small specimen. The furcal rami 5.5 times as long as wide at the proximal.

The 1st antenna extends a little beyond the middle of the furca. The mouth parts and swimming legs as described and figured by previous authors. The 1st leg with 3-jointed endopod. The terminal spine of the exopod of the 5th leg is slightly longer than half the length of the 3rd segment of the exopod (7:12).

Male. Length, 1.34–1.70 mm. The cephalothorax more slender than that of

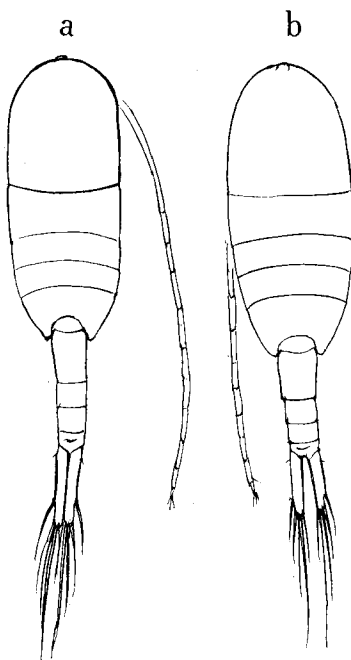


Fig. 167. *Lucicutia flavicornis* (CLAUS).
Female: a, specimen with slender abdomen; b, specimen with short abdomen.

the female. The abdomen is contained 1.7 times in the length of the cephalothorax. In the left 1st antenna the combined length of the segments 19–21 is equal in length to that of the segments 22–23.

In the 5th pair of legs the 2nd basal segment of the left leg has denticles on the inner marginal process which varies in number ranging from 4 to 8.

Remarks. According to GIESBRECHT the length of the furcal rami varies from $\frac{1}{3}$ to $\frac{1}{4}$ the combined length of the abdominal segments and furca. In the present specimens the furcal rami is longer in proportion to the length of the abdomen. For example, the female specimens measuring 1.46 mm and

1.65 mm in total length have the proportions of the cephalothorax to abdomen and those of the abdominal segments to furca:

Length mm.	cephalothorax to abdomen	abdominal segments to furca
1.46	50:29	31:13:9:38 = 100
1.65	50:36	25:13:12:10:40 = 100

the former has a more robust cephalothorax and short abdomen; the genital segment is more than twice as long as the 2nd segment; in the latter the genital segment is about twice as long as the 2nd; the anal segment is about the same in proportion in both specimens and is always longer in proportion to that figured by GIESBRECHT. In other respects these specimens have similar structures in the appendages. The large and slender one resembles *Lucicutia gemina* FARRAN in having long and parallel furcal rami but differs from it in the proportional lengths of the inner marginal spine on the 2nd segment of the exopod in the 5th pair of legs; the spine exceeds the base of the proximal seta on the 3rd segment of the exopod in the specimen.

Occurrence. Very common both in the surface and deep waters of the Izu region.

Distribution. The species has a wide distribution in the warm regions of the oceans.

Lucicutia curta FARRAN

(Fig. 168, a-f)

Lucicutia curta, FARRAN, 1905, p. 44; *Lucicutia longiserrata*, SARS, 1925, p. 277; FARRAN, 1926, p. 277; 1929, p. 264; WILSON, 1932, p. 129; JESPERSEN, 1934, p. 104; WILSON, 1950, p. 255.

Female. Length, 2.34 mm: cephalothorax, 1.70 mm; abdomen, 0.64 mm. The cephalothorax ovate in outline. The abdominal segments and furca are in the proportional lengths as 33:11:11:14:31=100 (left side). The furcal rami slightly asymmetrical, 3 times as long as broad. The genital segment slightly wider than long.

The 1st antenna exceeds the end of the furca by distal one segment. The 2nd antenna has the exopod 1.2 times as long as the endopod. The other mouth parts have no interesting features.

The 1st leg has 3-jointed endopod; the 1st segment of the exopod has an outer edge tooth on the base of the outer edge spine. In the 2nd to 4th legs the terminal spine of the exopod about half the length of the 3rd segment of the respective legs.

The 5th pair of legs has the terminal spine of the exopod which is slightly shorter than the 3rd segment of the exopod of the same leg.

Male. Length, 2.05 mm: cephalothorax, 1.41 mm; abdomen, 0.64 mm. The abdominal segments and furca are in the proportional lengths as 14:17:14:11:11:33=100. The furcal rami 4 times as long as wide.

The grasping antenna has the segments in the following proportions:

Joint.	1-2	3	4	5	6	7	8	9	10	11	12	13	14
	88	16	16	20	25	25	25	25	28	28	32	30	36
Joint.	15	16	17	18	19-20-21	22-23	24	25					
	56	68	76	88	100	100	60	31 = 1000					

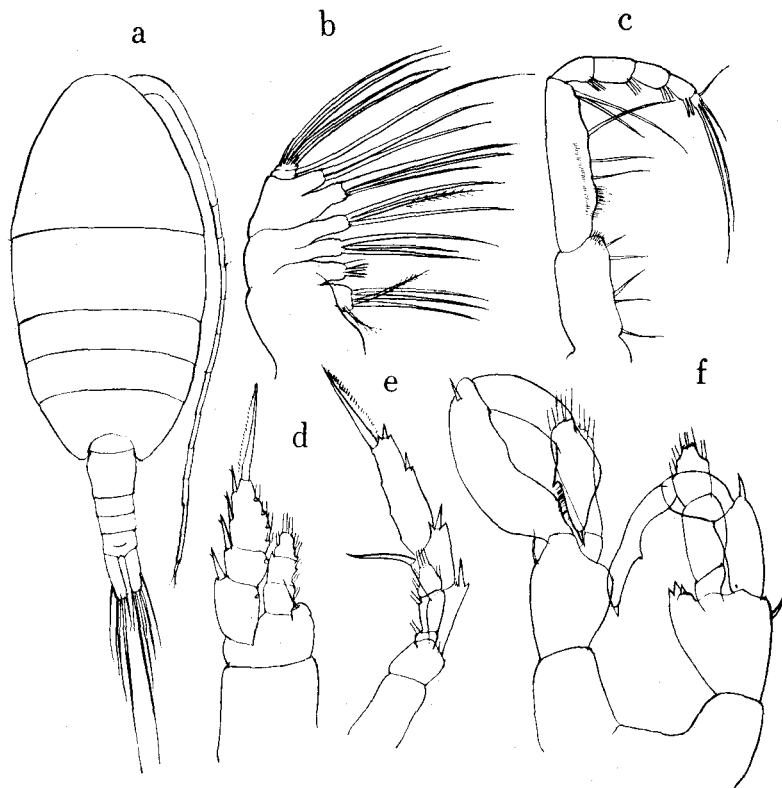


Fig. 168. *Lucicutia curta* FARRAN.

Female: a, dorsal aspect; b, 2nd maxilla; c, maxilliped; d, 1st leg; e, 5th leg. Male: f, 5th pair of legs.

The 2nd antenna has the exopod about 1.2 times as long as the endopod (33:27). The mandible, maxillae and maxilliped not characteristic.

In the 1st leg the proportional lengths of the terminal spine to the segments of the exopod are as follows: 21 (terminal spine): 12 (1st segment): 7 (2nd segment): 10 (3rd segment); these proportions are approximately the

same as those of *Lucicutia longiserrata* (GIESBRECHT).

In the 5th pair of legs the 2nd basal segment of the right leg rounded on the inner margin; the left leg as that of *L. longiserrata* (GIESBRECHT) but the innermost process near the base of the endopod is pointed at the apex.

Remarks. The specimen described by SARS (1925) under the name *L. longiserrata* has 3-jointed endopod on the 1st leg and agrees closely with *L. curta* FARRAN. SARS' specimen has the furcal rami about 3 times as long as wide. These two specimens resemble very closely in general appearance each other but the 3-jointed endopod of the 1st leg is the distinct character of *L. curta* FARRAN, which separates *L. longiserrata* GIESBRECHT from *L. curta* FARRAN.

Occurrence. 5 females and 4 males from Sagami Bay in the hauls from depth 1000 m to the surface, November, 1937, and one male from Suruga, December 1937.

Distribution. The species has been recorded from the North Atlantic.

Lucicutia lucida FARRAN

(Fig. 169, a-c)

Lucicutia lucida, FARRAN, 1908, p. 62, pl. III, fig. 22; pl. VI, figs. 16-20; WILSON 1950, p. 256. (non *Lucicutia lucida*, SARS, 1925, p. 219).

Male. Length, 3.35 mm: The cephalothorax elongate ovate in outline. The abdomen is contained about 1.4 times in the length of the cephalothorax. The abdominal segments and furca are in the following proportional lengths: 9:15:16:13:21:26=100. The furcal rami 4 times as long as wide.

The 1st antenna reaches back to the end of the 4th abdominal segment. The grasping antenna is on the left side; the segments are in the following proportional lengths:

Joint.	1-2	3	4	5	6	7	8	9	10	11	12	13	14
	86	19	22	25	25	25	29	25	25	25	25	35	48
Joint.	15	16	17	18	19-20-21	22-23	24	25					
	57	71	71	64	117	126	54	25 = 1000					

The mouth parts do not show any noticeable features and are similar in structure to those of the male of *Lucicutia magna* WOLFENDEN.

The 1st leg has 3-jointed endopod. The 2nd to 4th legs are of the usual type.

In the right 5th leg the 1st basal segment has, beside a spinous process, a haired protuberance; the 2nd basal segment smooth on the inner margin; the exopod and endopod 2-jointed; the 1st segment of the exopod has a strong distal spine on the outer edge of the 1st segment; the 2nd segment has a low

process on the inner margin about the middle of the segment where the terminal 2 segments of the exopod fused. The left leg has a large process bearing 4 spinules on the 2nd basal segment and a very small process near the inner proximal margin; the exopod and endopod 3-jointed.

Remarks. The present specimen agree well with *L. lucida* described by FARRAN taken from the Irish Atlantic Slope. Sars' *L. lucida* both female and male differ somewhat from those originally described by FARRAN. The male specimen of Sars' *lucida* clearly differs from FARRAN's specimen is the structure

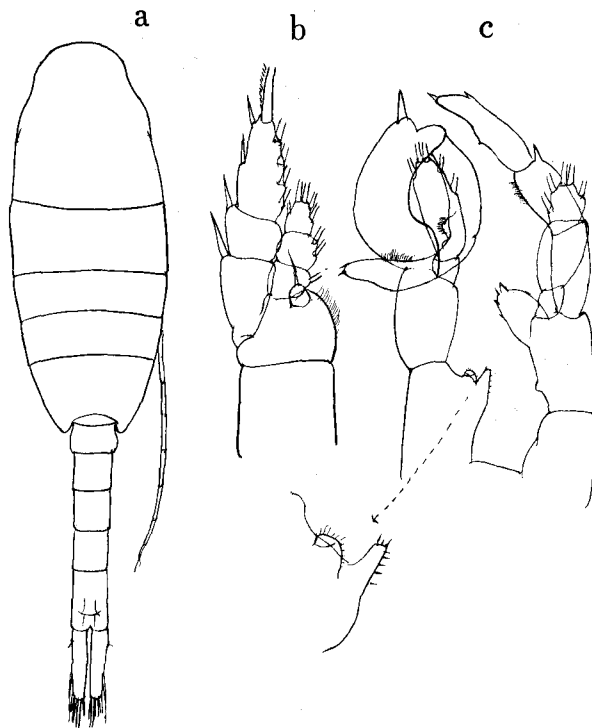


Fig. 169. *Lucicutia lucida* FARRAN.

Female: a, Male; a, dorsal aspect; b, 1st leg; c, 5th pair of legs.

of the 5th pair of legs. Sars' female specimen of *lucida* has the abdominal segments and furca differing from FARRAN's in the proportional lengths, and has the genital segment peculiar in form which is similar to that of *L. pera* A. SCOTT. The female specimen of Sars' *lucida* is identical with *L. pera* A. SCOTT; in *pera* the terminal spine of the exopod of the 5th leg is about $\frac{1}{3}$ the length of the 3rd segment of the exopod, whereas, in *lucida* FARRAN it is about half the length of the same segment. The male specimen of Sars' *lucida* differs clearly from FARRAN's which will be described in the following.

Occurrence. One male specimen from the deep water of Sagami Bay.

Distribution. The species has been recorded from the North Atlantic and from the Pacific near the Galapagos and Phillipine Islands.

Lucicutia pera A. SCOTT

(Fig. 170, a-c)

Lucicutia pera, A. SCOTT, 1909, p. 129, pl. XL figs. 1-9 (female); *Lucicutia lucida*, SARS, 1925, p. 219, pl. LIX, fig. 11 (male).

A specimen which SARS described and figured under the name *L. lucida* was found in the present collection from the depth 1400 to the surface in Suruga

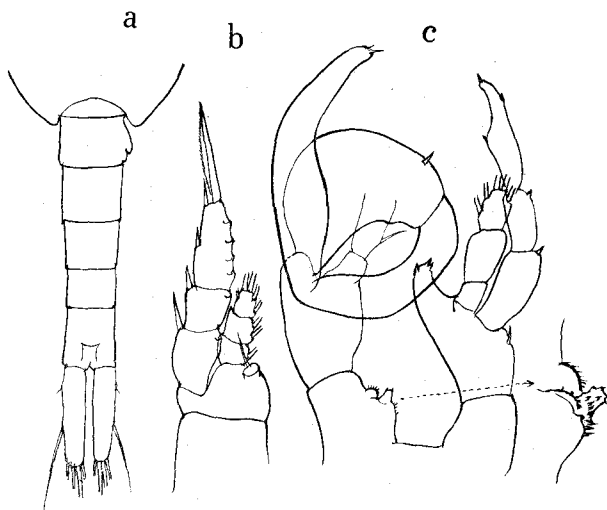


Fig. 170. *Lucicutia pera* A. SCOTT.

Male: a, abdomen, dorsal aspect; b, 1st leg; c, 5th pair of legs.

Bay. SARS gives only a brief description and figures. The present specimen is quite identical with SARS' specimen of *lucida* which is clearly different from that originally described and figured by FARRAN as *L. lucida* in the structure of the male 5th pair of legs.

Male. Length, 2.85 mm: cephalothorax, 1.73 mm; abdomen, 1.12 mm. General appearance as in *L. lucida* FARRAN. The abdomen is contained 1.5 times in the length of the cephalothorax. The abdomen 5-jointed; the segments and furca are in the proportional lengths as 11:16:13:13:18:29=100. The anal segment is short in proportion to that of *L. lucida*. The furcal rami 4 times as long as wide.

The right 1st antenna reaches back to the middle of the furca. The grasping antenna on the left side; the segments are in the proportional lengths:

Joint.	1-2	3	4	5	6	7	8	9	10	11	12	13	14
	91	20	20	24	24	27	27	24	24	24	24	40	57
Joint.	15	16	17	18	19-20-21	22-23	24	25					
	64	71	71	64	110	110	54	30 = 1000					

the segments 2 and 3 are each furnished with minute spines on the posterior margin. The mouth parts as those of of *L. lucida* FARRAN.

The 1st leg has 3-jointed endopod. The 5th pair of legs agrees well with the figure given by SARS (fig. 11). The right leg has a spinous process which differs somewhat in form from that of FARRAN's figure on the inner margin of the 1st basal segment; the 1st segment of the exopod is very voluminous and carries a small spine on the distal outer margin; this spine is in *lucida* FARRAN very strong; the demarcation between the 1st and 2nd segments of the exopod is fairly distinct and the combined length of these segments is much longer in proportion to that of *L. lucida* FARRAN. In the left leg the 2nd basal segment is of similar structure to that of *L. lucida* FARRAN but the small process on the proximal inner margin of the same segment is wanting in SARS' specimen.

Remarks. SARS is of opinion that *L. pera* A. SCOTT is identical with *L. lucida* FARRAN. But SARS' female specimen of *L. lucida* measuring 3.60 mm in total length is identical with *L. pera* A. SCOTT which is 4.0 mm in total length and is easily recognized by the peculiar form of the genital segment. SARS' male specimen of *L. lucida* is not identical with *L. lucida* FARRAN but identical with *L. pera* A. SCOTT. My male specimen of *L. lucida* FARRAN measured 3.35 mm in total length.

Occurrence. The species has been recorded from the Malay Archipelago and from the temperate Atlantic.

Lucicutia wolfendeni nom. nov.

(Fig. 171, a-h)

Lucicutia grandis, WOLFENDEN, 1904, p. 121; FARRAN, 1908, p. 61; SARS 1925, p. 208, pl. LVI; FARRAN 1929 p. 264; JESPERSEN, 1934 p. 104.
(non *Lucicutia grandis*, GIESBRECHT, 1895 p. 258).

Lucicutia grandis was first described by GIESBRECHT from the male specimen taken in the Pacific Ocean. WOLFENDEN described a female specimen taken in the Atlantic under the name *L. grandis* believing that his specimen is identical with GIESBRECHT's specimen. FARRAN or SARS described WOLFENDEN's form under the same name from the Atlantic. SEWELL (1932), though he has not

described any of GIESBRECHT's or WOLFENDEN's forms, is of opinion that the Pacific and Atlantic forms are not identical, and since GIESBRECHT's name for the Pacific has undoubted priority, the form described by WOLFENDEN or by SARS from the Atlantic must be given a different name; he proposed the name, *L. wolfendeni*. So far as the male is concerned there is some difference between

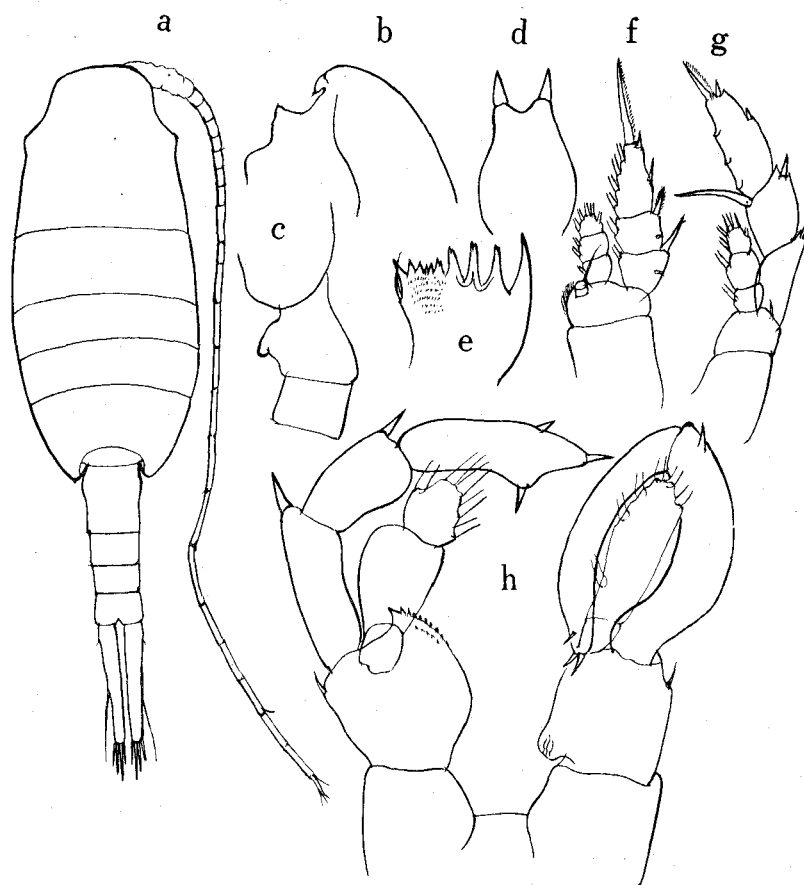


Fig. 171. *Lucicutia wolfendeni* nom. nov.

Female: a, dorsal aspect; b, head, lateral aspect; c, last thoracic segment and genital segment, lateral aspect; d, rostrum; e, biting blade of mandible; f, 1st leg; g, 5th leg. Male: h, 5th pair of legs.

these two forms in the structure of the 5th pair of legs. In my collection there occurred the specimens of two sexes quite identical with the form described by WOLFENDEN under the name *L. grandis*. This male specimen differs from that described by GIESBRECHT in the proportional lengths of the grasping antenna and in the structure of the 2nd basal segment of the right 5th leg.

The difference between these two forms have been regarded as a variety caused by the difference in the geographical distribution. But since the form that had been believed to be a characteristic form of the Atlantic was detected also from the Pacific, and that the male specimen clearly differs from that described by GIESBRECHT, it is advisable at the present time as SEWELL proposed to give the name *L. wolfendeni* for the form described by WOLFENDEN.

Female. Length, 7.64 mm: cephalothorax, 4.45 mm; abdomen, 3.19 mm. The lateral hook on the cephalic segment not pointed. The lateral corner of the last thoracic segment rounded. The rostrum bifurcate with strong spines slightly notched on the inner margin.

The abdominal segments and furca are in the proportional lengths as 23:14:8:12:43=100. The genital segment produced below. The anal segment wider at the distal than at the proximal. The furcal rami is nearly equal to the combined length of the first three segments, and 10 times as long as it is wide at the distal.

The 1st antenna exceeds the end of the furca by at least 3 terminal segments; the segments are in the following proportional lengths:

Joint.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	27	6	7	8	10	11	11	11	10	11	13	14	22	24
Joint.	15	16	17	18	19	20	21	22	23	24	25			
	27	29	31	33	37	28	25	24	26	22	13	= 1000		

The 2nd antenna has the exopod about 1.3 times as long as the endopod. The mandible has the exopod slightly longer than the endopod (17:15). The 1st maxilla has 5 setae on the outer lobe, 11 setae on the exopod, 9 setae on the endopod, 3 setae on the 2nd basal segment, 2 setae and a short curved spine on the 3rd inner lobe, 3 setae on the 2nd inner lobe. The 2nd maxilla is not characteristic. The maxilliped has the basal segments and endopod in the proportional lengths as 37:43:42 (endopod); the 2nd basal segment has 4 setae on the anterior margin and 2 setae on the distal margin; the segments are furnished with rows of minute spines.

The 1st leg has 3-jointed endopod. In the 5th pair legs the terminal spine of the exopod half as long as the 3rd segment of the exopod; the inner edge spine of the 2nd segment of the exopod extends to the base of the 3rd inner marginal seta on the 3rd segment of the exopod.

Male. Length, 6.93 mm: cephalothorax, 3.87 mm; abdomen, 3.06 mm. General appearance as in the female but the cephalic hook less prominent.

The abdominal segments and furca are in the proportional lengths as 11:14:12:10:10:43=100. The furcal rami is nearly equal in length to the last 4 segments taken together, and more than 10 times as long as it is wide at the distal end.

The right 1st antenna exceeds the end of the furca by distal 2 segments when fully extended. The grasping antenna reaches back to the end of the furca; the segments are in the following proportional lengths:

Joint.	1-2	3	4	5	6	7	8	9	10	11	12	13	14
	63	18	25	28	23	25	23	20	20	23	25	40	48
Joint.	15	16	17	18	19-20-21		22-23		24	25			
	65	76	73	60	144		121		50	30 = 1000			

the segments 9, 10, 11 and 12 are partially fused; the segments 19-21 and the segments 22-23 are completely fused; according to GIESBRECHT the combined length of the segments 19 to 25 is shorter than the segments 14-18 taken together, but in the present specimen the segments 19-25 are longer than the segments 14-18 (128:137).

The mouth parts and swimming legs as those of the female.

The 5th pair of legs resembles that of *L. grandis* GIESBRECHT except that the inner margin of the 2nd basal segment of the right leg is not produced and is devoid of teeth on the distal margin; the inner proximal corner is produced internally and has some rumples near the apex. The 2nd basal segment of the left leg is produced on the inner distal corner and is furnished with 11 teeth.

Remarks. The present specimen agrees fairly well with WOLFENDEN's form described and figured by SARS. But the female specimen differs slightly from that of SARS' in the proportional length of the 1st antenna and in the proportional length of the inner edge spine of the 2nd segment of the exopod to the 3rd segment of the exopod in the 5th pair of legs. The male specimen, though differs slightly from that described by SARS in the proportional lengths of the abdominal segments and furca, has the 5th pair of legs quite similar in the structure to that figured by SARS.

Occurrence. One female and two males in the vertical hauls from 1000 m to the surface in Sagami Bay, November, 1937.

Distribution. The species has been recorded from the Atlantic. In Japan Marukawa recorded its occurrence from the Ochotsk Sea.

Lucicutia maxima STEUER

(Fig. 172, a-e)

Lucicutia maxima, STEUER, 1904, p. 596 (female); A. SCOTT, 1909, p. 127 (male); SEWELL, 1932, p. 295.

Male. Length, 7.44 mm: cephalothorax, 4.32 mm; abdomen, 3.12 mm. The cephalothorax ovate in outline. The head has an acute triangular lateral hook

on each side. The rostrum consists of a oval base to which 2 stout spines are attached.

The abdominal segments and furca are in the proportional lengths at $11:16:14:11:14:34=100$. The furcal rami are equal to half the length of the abdominal segments taken together, and about 6 times as long as it is wide at the proximal.

The right 1st antenna reaches back to the posterior margin of the anal

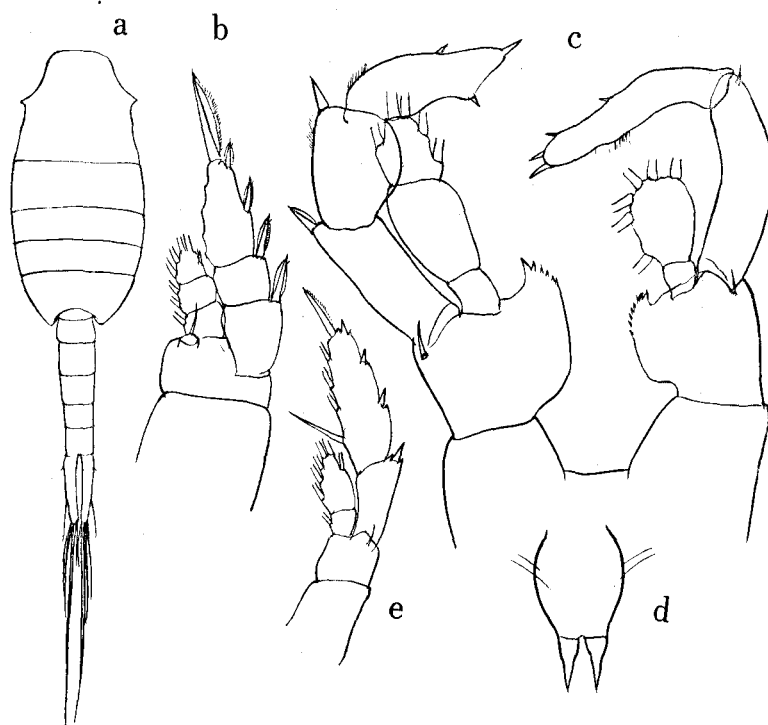


Fig. 172. *Lucicutia maxima* STEUER.

Female: a, dorsal aspect; b, 1st leg; c, 5th pair of legs; d, rostrum; Immature female; e, 5th leg.

segment. The grasping antenna on the left side; the segments are in the following proportional lengths:

Joint.	1-2	3	4	5	6	7	8	9	10	11	12	13	14
	77	17	20	23	23	23	20	20	20	23	20	43	52
Joint.	15	16	17	18	19-20-21	22-23	24	25					
	66	74	74	63	138	123	52	29 = 1000					

the combined length of the segments 19-25 is nearly equal to that of the

segments 14-18. The mouth parts and swimming legs resemble those of the preceding species.

In the 5th pair of legs the 2nd basal segment has, beside 2 strong teeth, 4 small ones on the inner distal margin; according to SEWELL these small teeth vary in number from a single to 7; the 2nd basal of the right leg produced internally and has 9 small teeth on the inner distal edge.

Remarks. The present male specimen agrees well with that described and figured by A. SCOTT except that the cephalothorax is more robust in the present specimens. SARS' specimen of *L. maxima* differs from that of SEWELL and also from my specimens in the proportional length of the furcal rami and in the structure of the male 5th pair of legs. SEWELL's figure of the male specimen of *L. maxima* (text-fig. 94) differs considerably from that of A. SCOTT in the proportional length of the furcal rami which is half the length of the abdominal segments and furca taken together, whereas, in A. SCOTT's specimen it is half the combined length of the abdominal segments.

Immature female. Length, 5.95 mm. The specimen is in the 5th copepodite stage. General appearance as in the female. The abdomen consists of 4 segments. The segments and furca are in the proportional lengths as 13:12:12:23:40=100. The furcal rami nearly equal in length to the combined length of the first 3 abdominal segments, and 6 times as long as wide. The 1st antenna exceeds the distal margin of the furca by terminal 3 segments. The 5th leg with 2-jointed exopod and endopod.

Occurrence. 3 adult males and 6 immature females from Sagami Bay in the vertical hauls from 1000-0 m.

Distribution. The species has been recorded from the Indian Ocean and the Malay Archipelago.

Lucicutia bicornuta WOLFENDEN

(Fig. 173, a-d)

Lucicutia bicornuta, A. SCOTT, 1909, pl. XXXIX, figs. 1-11; WOLFENDEN, 1911, p. 321, text-fig. 63 a-c; SEWELL, 1913, p. 354; SARS, 1925, p. 214, pl. LVIII, figs. 1-3; SEWELL, 1932, p. 290; 1947, p. 173; BRODSKY, 1950, p. 339, fig. 237.

Female. Length, 7.51 mm; cephalothorax, 3.95 mm; abdomen, 3.56 mm. The frontal margin of the head is furnished with 2 spines; the lateral margin of the head is furnished with a hook on each side. The abdominal segments and furca are in the proportional lengths as 19:8:8:12:53=100. The genital segment has, beside a genital protuberance, a moderately large tubercle near the posterior margin of the ventral surface. The furcal rami 22 times as long as it is wide at the distal or 11 times as it is wide at the proximal.

The 1st antenna exceeds the end of the furca by last 2 segments. The

mouth parts and swimming legs as described and figured by WOLFENDEN or by SARS.

Male. Length, 7.00 mm. The cephalothorax as long as the abdomen. The grasping antenna reaches back to the end of the furca. The 5th pair of legs as figured by WOLFENDEN.

Occurrence. 11 females and 2 immature females from the deep water of Suruga Bay, and 3 females and 6 males from Sagami Bay, December, 1937.

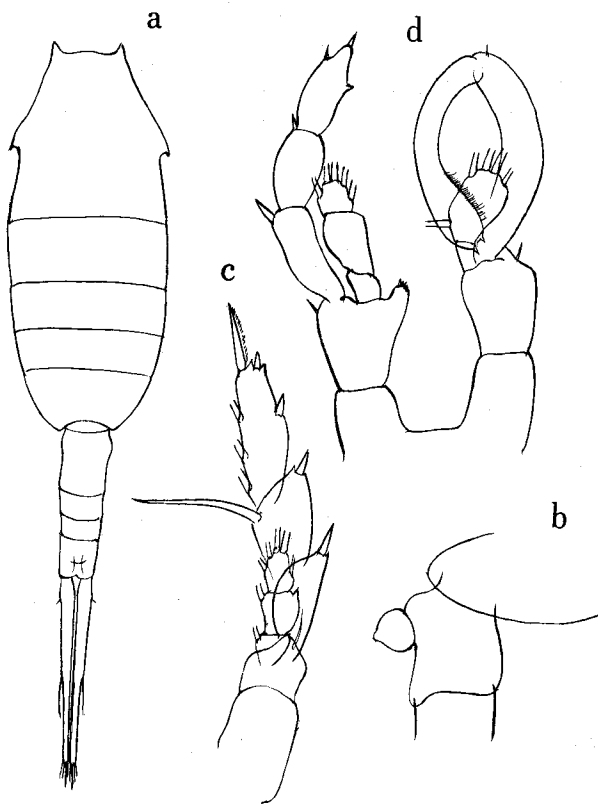


Fig. 173. *Lucicutia cornuta* WOLFENDEN.
Female: a, dorsal aspect; b, genital segment, lateral aspect;
c, 5th leg. Male: d, 5th pair of legs.

Distribution. The species has been recorded from the Atlantic Ocean, the Malay Archipelago, Indian Ocean, Antarctic and far eastern seas of the U.S.S.R.

Genus *Isochaeta* GIESBRECHT

The genus comprises a single species which is closely related to *Lucicutia* GIESBRECHT, differing only from it in the number of setae on the 1st maxilla

and in the segmentation of the endopod of the female 5th leg. The distal segment of the endopod of the 2nd leg has, according to GIESBRECHT, 4 setae but according to FARRAN the segment is furnished with 5 setae, but in the present specimen the segment has 6 setae in all.

Isochaeta ovalis GIESBRECHT

(Fig. 174, a-i)

Isochaeta ovalis, GIESBRECHT, 1892, p. 63, 367, t. 29, figs. 15-17; t. 38, figs. 33, 34; WOLFENDEN, 1911, p. 320; FARRAN, 1926, p. 268.

Female. Length, 1.69 mm: cephalothorax, 1.14 mm; abdomen, 0.55 mm. The cephalothorax ovate in shape; the greatest width 0.64 mm. The rostrum with 2 slender filaments.

The abdominal segments and furca are in the proportional lengths as 36:9:7:16:32=100. The genital segment produced triangularly below. The furcal rami slightly asymmetrical, as long as the combined length of the first 3 segments, and 4 times as long as wide. The 2nd furcal seta about as long as the abdomen; the outer most seta about half the length of the ramus.

The 1st antenna extends when reflexed to the end of the anal segment; the segments are in the following proportional lengths:

Joint.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	87	10	15	13	15	15	15	21	26	26	26	31	46	46
Joint.	15	16	17	18	19	20	21	22	23	24	25			
	52	56	56	62	67	56	52	56	59	56	36	= 1000		

The 2nd antenna with 8-jointed exopod and 2-jointed endopod; the 1st segment of the endopod is furnished with hairs on the outer margin; the 2nd segment has 8 setae on the 1st lobe and 6 setae on the 2nd lobe; the exopod a little shorter than the endopod (18:20). The mandible with the exopod as long as the endopod; the 2nd basal has 3 marginal setae; the teeth on the biting part strong. The 1st maxilla has 5 setae on the outer lobe 11 setae on the exopod, 9 setae on the endopod, 5 setae on the 2nd basal. The 2nd maxilla as that of *Lucicutia* but the lobes on the anterior margin are longer. The maxilliped has the basal segments and endopod in the proportional lengths as 30:46:33 (endopod); the 1st basal segment has a row of coarse hair-like spines near the posterior margin and on the distal corner of the anterior margin; the 2nd basal segment has a row of hair-like spines on the proximal part of the anterior margin which is provided with 3 and 2 setae.

The 1st to 4th legs have each 3-jointed exopod and endopod. The number of setae on the segments of the exopod and endopod as follows:

	Re 3	Re 2	Re 1	Ri 3	Ri 2	Ri 1
1st leg	4	1	1	5	2	1
2nd leg	5	1	1	6	2	1
3rd leg	5	1	1	6	2	1
4th leg	5	1	1	5	2	1
5th leg	4	1	0		5	0

The 5th pair of legs has 2-jointed endopod; the terminal spine of the exopod about as long as the 3rd segment of the exopod (14:15); the inner

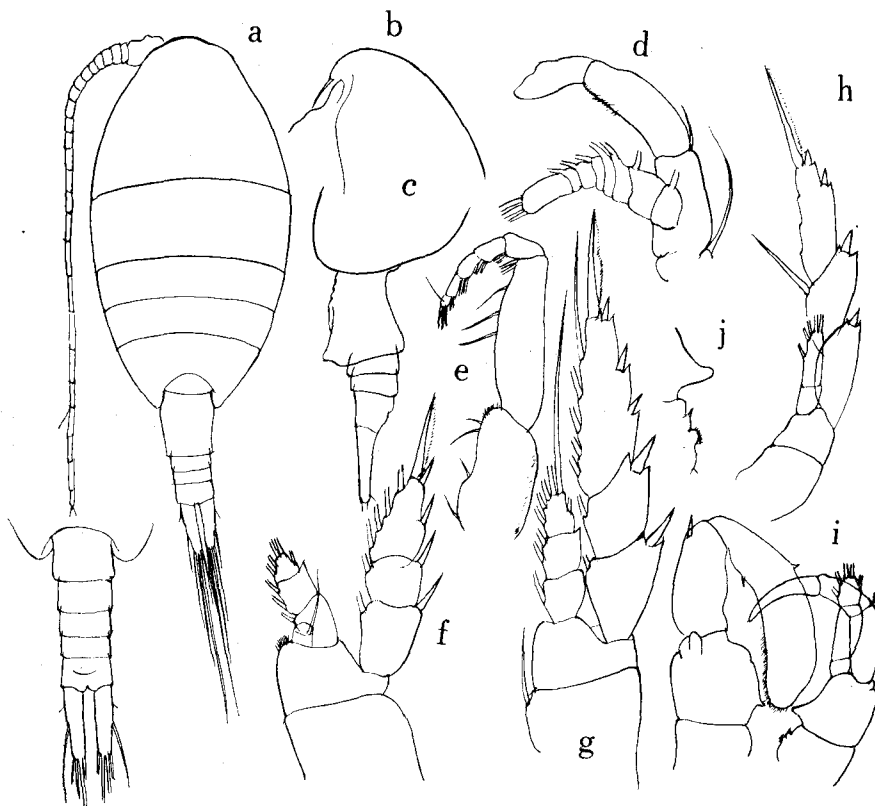


Fig. 174. *Isochaeta ovalis* GIESBRECHT.

Female: a, dorsal aspect; b, head, lateral aspect; c, last thoracic segment and abdomen, lateral aspect; d, 2nd antenna; e, maxilliped; f, 1st leg; g, 2nd leg; h, 5th leg. Male: i, 5th pair of legs.

marginal seta on the 2nd segment of the exopod does not extend to the base of the 3rd inner marginal seta of the distal segment of the exopod.

Male. Length, 1.55 mm; cephalothorax, 1.07 mm; abdomen, 0.48 mm. General appearance as in the female. The abdominal segments and furca are in the

proportional lengths as 17:13:12:8:13:37=100. The furcal rami 1.4 times as long as wide.

The right 1st antenna reaches back to the posterior margin of the anal segment. The grasping antenna on the left side. The mouth appendages and 1st to 4th legs as in the female.

In the 5th pair of legs the right leg has 3-jointed endopod and 2-jointed exopod; the distal segment of the exopod much dilated; the 2nd basal segment has a small process on the inner margin. In the left leg the 1st basal segment has 2 processes of which the proximal one is finely serrated; the 2nd basal segment is produced on the inner proximal margin; the exopod 3-jointed; the combined length of the segments are about as long as the 2nd segment of the exopod of the right leg.

Remarks. The species can be easily recognised by its small size, robust cephalothorax and 2-jointed endopod of the 5th leg in the female. The male specimen has 3-jointed endopod in the right 5th leg. According to GIESBRECHT the 3rd segment of the endopod of the 2nd leg has only 4 setae; FARRAN's specimen from the Bay of Biscay has 5 setae on the same segment; the present specimen has 6 setae on the same segment. The 3rd and 4th legs have each, as FARRAN described, 6 setae on the 3rd segment of the endopod.

Occurrence. 9 females and 6 males from deep water of the Izu region in November, 1937.

Distribution. The species has been recorded from the Pacific, Atlantic and Antarctic Oceans.